AMATEUR WORK

DESIGNS FOR INLAYING WITH PATTERNS OF STRINGING.

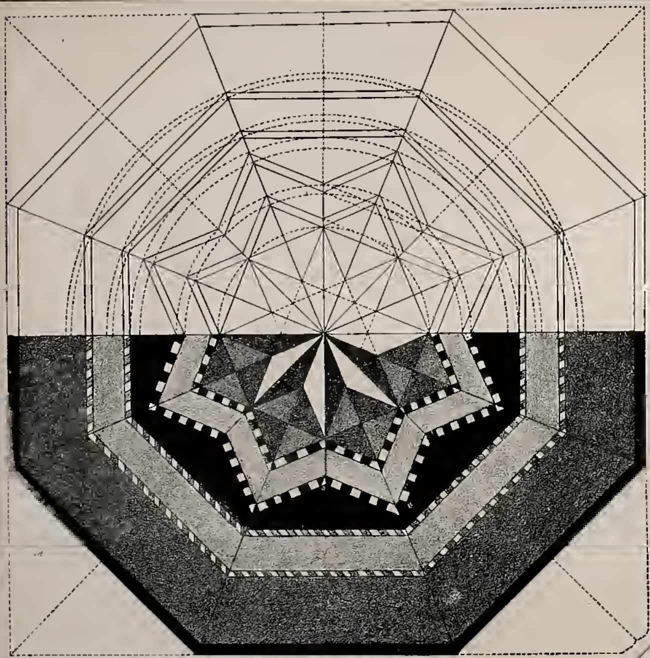


FIG. 1. Design for Top of Small Work Table in Plan.

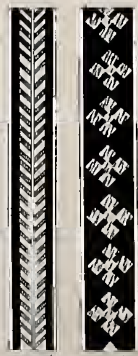


FIG. 4. Patterns of Stringing.

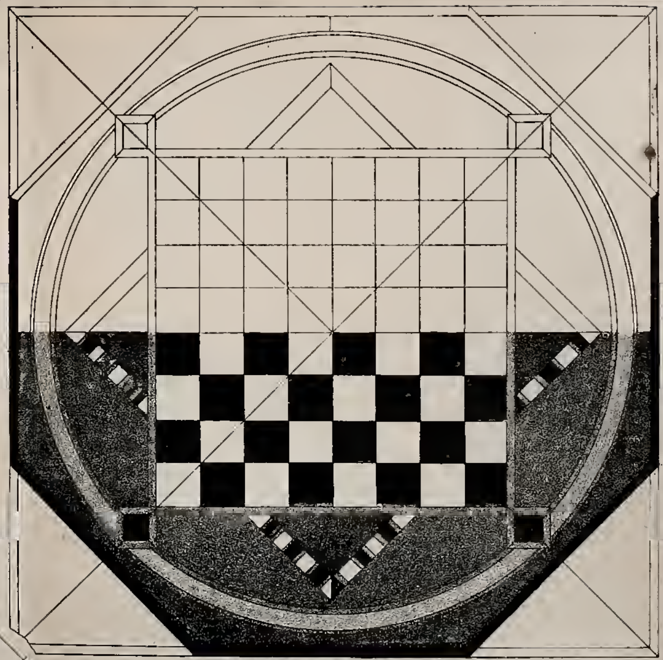


FIG. 2. Design for Top of Chess Table in Plan.

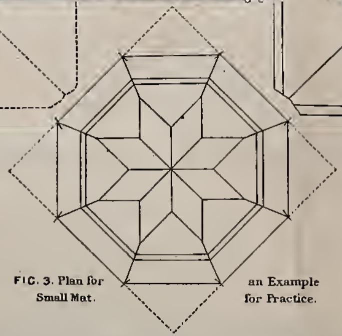


FIG. 3. Plan for Small Mat. an Example for Practice.

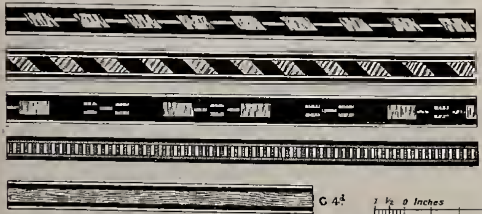
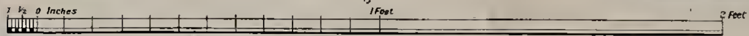


FIG. 4. (Continued.) Patterns of Stringing



Scale 3 Inches to 1 Foot reading to ⅛ Inches & shewing 2 Feet. R. F. ¼

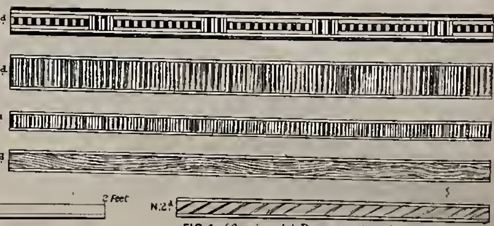


FIG. 4. (Continued.) Patterns of Stringing

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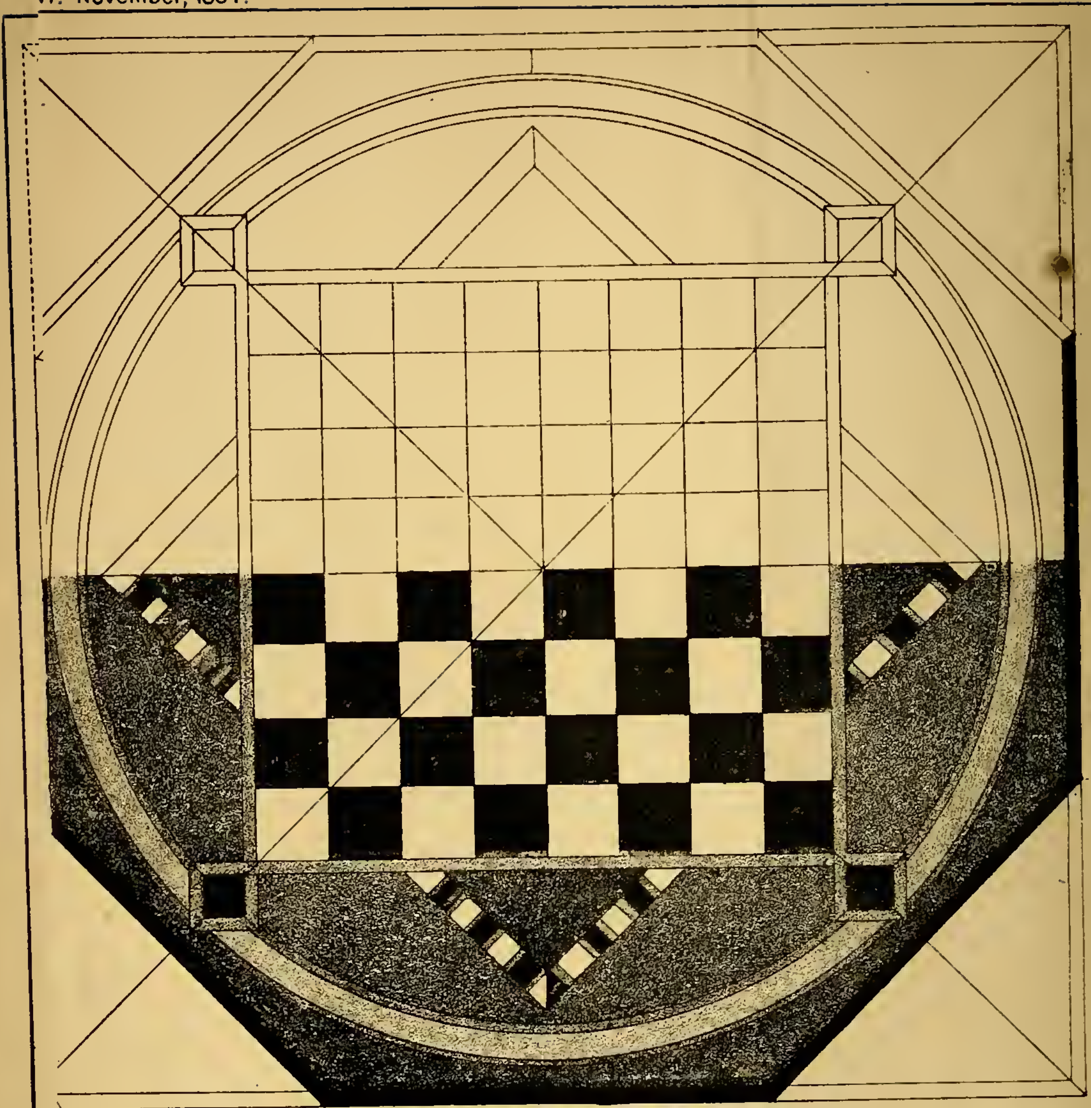
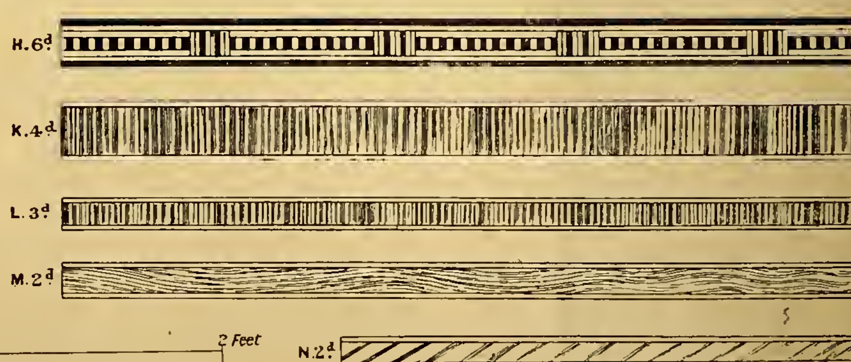


FIG. 2. Design for Top of Chess Table in Plan.



iple
ice.

2 Feet

Feet. R F. ¼

FIG. 4. (*Continued*) Patterns of Stringing

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W.

AMATEUR WORK,

ILLUSTRATED.

EDITED BY THE AUTHOR OF

"EVERY MAN HIS OWN MECHANIC."

WITH SUPPLEMENTS,

Containing Designs and Working Drawings to Scale,
For Various Pieces of Work, Useful and Ornamental,

AND

SEVERAL HUNDRED DIAGRAMS AND ENGRAVINGS ON WOOD.

VOLUME IV.

London:
WARD, LOCK, & Co., WARWICK HOUSE, SALISBURY SQUARE, E.C.
NEW YORK: BOND STREET.

[1886]

AMATEUR WORK, ILLUSTRATED.

THE ART OF INLAYING IN VENEERS.

By WALTER J. STANFORD.

(*For Figs.* 1, 2, 3, 4, *see Folding Sheet issued with this Part.*)

I.—INTRODUCTORY—TOOLS AND MATERIALS—PREPARATION OF THE WOOD—DRAWING PATTERN ON WOOD—STAR AS EXAMPLE—PROCESS DESCRIBED.

THE art of inlaying in veneers is one very little known to amateurs. Many, doubtless, have seen beautiful inlaid tables and work-boxes, and vaguely wondered how they were made, putting the very idea of being themselves able to make them, aside, as absurdly impossible. In this article I hope to unravel the deep mystery of the work, and turn it into mere cutting and planing; and show you how to turn out tables as beautiful, if not more so, than many who read this article have ever seen.

I must begin by asking everybody, once for all, to drive out of their heads the idea that the work is difficult. The tables which I intend to describe I made when I was fifteen, and there were many in our shops made by boys of twelve and thirteen, and many who couldn't plane up a common board, were able to turn out most beautiful work in veneers. So I hope, reassured by this assertion, which is strictly true, no one will fault the work. It is essentially work for amateurs, and those who cannot do the carpenter's work for themselves, can easily get it done for them. In writing, I shall always suppose that the carpenter's work *can be* done, as it would be absurd to think that we could inlay, or rather onlay, without something to work upon. The work I am going to treat of is totally different from what is called "marquetry," or inlaying scroll designs: that we may leave more or less to the trade—you will get no pleasure, and a very small profit, out of it. The style is clearly illustrated by the accompanying designs for a tea-table and a chessboard, Figs. 1 and 2. The drawings to scale which are given in Figs. 1 and 2, are exact representations of the pattern, and are drawn to an accurate scale of three inches to a foot, so that every line represented is quarter full size; and the easiest way for a beginner to increase each line, is to take the distance on the drawing in his compass, and to step it four times along any straight line, and then take up the whole distance. Half of each drawing has been tinted in lines to give the *general* effect, and to aid in distinguishing the pattern from the construction. I do not for a moment pretend to say that the tints represent the woods that will be in their places; nothing but the general effect is aimed at. The small pattern in Fig. 3 is drawn on the same scale, and is given as a suggestion for practice, before the tables are tried; the design is similar to the one in the tea-table; but there is a difference, as I shall point out directly, and the reason for the difference. I strongly recommend you to practise on the little one, and not spoil the big ones by not having got into the way of the work. I must leave my remarks on the "stringing," patterns of which are given in Fig. 4, for my next paper.

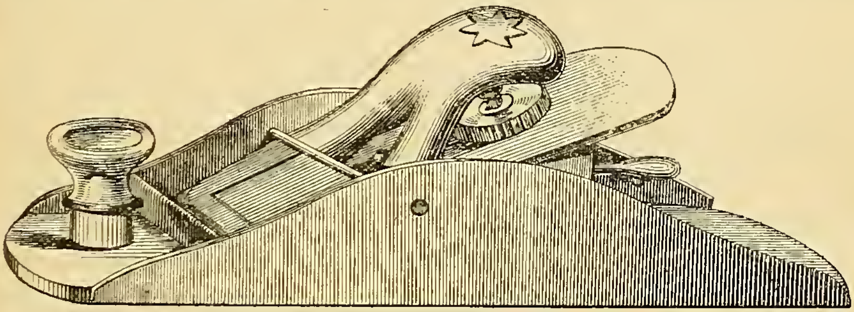


FIG. 5.—AMERICAN PLANE WITH ADJUSTABLE IRON.

The first thing necessary to be done is to provide yourself with the requisite tools, most of which all carpenters have already. The prices given below are for tools of the best quality, which I have picked myself from Messrs. Booth Bros.', *Dublin*, catalogue and stock, and anyone who can afford to buy the set, as given here, will have tools that will do good work,

and give great satisfaction ; but inferior and cheaper tools are kept, and can be supplied by Messrs. Booth, of *Stephen Street* :—

List of Tools.	*s.*	*d.*
American plane with adjustable iron (Fig. 5)	4	0
Mount knife (Fig. 6)	2	6
Veneering hammer and handle (Fig. 7)	1	10
Inch and half-inch chisels, 1s. each	2	0
Steel rule (1 foot)	2	0
Shooting-board (Fig. 8)	4	0
Glue-pot	2	0
Oil-stone, Grecian	2	0
Tooth-plane, with fine teeth (Fig. 9)	3	3
Scraper, without handle, as in Fig. 10	0	5
Scraper sharpener (Fig. 11)	0	7
Two-foot square (teak)	1	6
Pair of trammel heads (compasses) (Fig. 12)	2	6

Do not be frightened by this list. I have put down everything that can possibly be wanted, and the best quality of everything, as I don't believe in, and never use, cheap things ; but that is no reason why other people should think so too. Messrs. Booth will supply you, on paying postage, with their price lists, and you can pick and choose. They will send the above separately, or collectively.

If you set *yourself* up, remember to start with a good shooting-board (Fig. 8), as therein lies the real success of the work. A common hammer, with a back like that shown in Fig. 7, and a strong penknife with a flat point, not a bevelled off one, will answer as well as a mount knife, though you get great value out of the mount knives. Let the glue-pot be a large one, and the oil-stone a good one, and the rest will take care of themselves. A common compass with lengthening bar and a pencil leg will do as well as the trammel, and would be much cheaper, but the trammel is handy. I should advise that everything used for veneering should be kept entirely for the work, especially the plane, shooting-board, glue-pot, and knife. We must now see about veneers, and then we will get to work. I give a list below of the ones most required for the work, and the prices per superficial foot, as supplied by James Booth and Co., 26, *Ship Street, Dublin.* The veneers are of the best quality, and they are not to be had cheaper in London, but most timber merchants keep them; and a *nice price they generally ask for them.*

Veneers in Natural Woods.

	s.	*d.*		*s.*	*d.*
Rosewood	0	4	Ebony	0	6
Satinwood. 6d. &	0	9	Purple	0	6
Whitewood	0	2	Bird's-eye maple	0	4
Tulip	1	0	American ash	0	2
Amboyna	1	0	Riga oak	0	4
Yacca	0	6	Curled walnut	1	0
Plain walnut	0	1	Mahogany	0	3

Veneers in Dyed Woods.

	s.	*d.*		*s.*	*d.*
Black	0	4	Green	0	6
Yellow	0	6	Grey	0	6
Blue	0	6			

With such a list as that, no one can complain of want of variety. Yellow pine is the wood generally used for a ground, as the glue takes a great hold on it, and consequently the veneer is less likely to peel off when exposed to a hot sun or fire. Procure a 1 inch board about 4 feet by 13 inches, and having cut it in half, make a *good joint*, so as to have a piece about 23 inches square. Plane up the surface of this with the trying plane very true all over, for the veneer won't stick on hills and hollows ; then square two edges to each other, also to be very exact ; put a pencil mark on them, and draw all your square lines from these two edges. Across the bottom of the board screw two strong battens about 2 inches by $1\frac{1}{2}$ inch, having the 2 inch side standing off the board. This is to prevent the wood warping when the hot water and glue are applied on the other side. These should *never* be taken off permanently, and should be screwed on across the grain, about 6 inches from the sides. Now size the top, and when it is dry sand-paper it well, and it is ready for the pattern to be drawn on it. In drawing the patterns, on the small that (Fig. 3) it will be noticed that the point of each diamond that goes to make up the central star is on the line that runs to one of the corners of the octagon, whereas each corresponding point in the big one is off one of the central lines. Be careful of this. In drawing the small one, begin by drawing a perfect square, two sides of which are the two square edges, the other two fine pencil lines, drawn by an HHH pencil. Draw diagonal lines and central ones, both ways. With your pencil compass, take as centre one of the angle points of the square, and as radius, the distance to the centre, and with it cut two sides of the square; do this from all four corners with the same radius. Join the points thus found through the centre. With centre, the middle part of the table, and radius to scale, draw a circle cutting all the lines. Where the circle cuts each of the lines that you drew just now from points on the sides of the square, put a pencil point. Take one of them, miss out two, and join it to the third point, and so with all eight, and your star is complete. Try it on paper first. With the big one proceed just as before, only put your pencil points on the four lines from corner to corner, and on the four middle ones, and join as before, missing out two of the dotted ones each time. The reason is clear. In the small one it is small, and you have not room to bury the points, as you have in the big one (Fig. 1), and

you must have them pointing to the corners of the octagon, to finish up with. In the big one you want variety, and it makes a better pattern by not having all the joints in the same straight line. Try them both on paper first. We will now treat of the big one only (Fig. 1), for what applies to the big one in working, of course applies to the little one also.

Take some "white" and some "amboyna" to make the star, which altogether contains sixteen pieces each, being an isosceles triangle. There are two ways now of cutting the pieces: firstly, and the best way for practice, is to cut them one by one, planing them carefully, to fit each place; secondly, and the plan most used by people who want to get the work quickly done, is as follows: Cut one in veneer to fit a triangle, lay it on the top of the shooting-board, with its angular sides inwards, and the long side towards the plane, so that its long side makes a perfect straight line with the edge of the shooting-board; hold it firm, and draw pencil lines behind it on the two sides. Glue two waste pieces of veneer to these lines, so as to form an angular recess. (See Fig. 8.) Cut and plane sixteen pieces, eight of each wood to fit this recess, and then with your plane in front, plane off till you are stopped by the shooting-board; then, if your mould has been made rightly, you will have all your pieces fitting, ready to be glued on. I should have mentioned before that it is useless to draw more than the star at first, as the rest is sure to be washed off by the hot water. A word now about the glue: (1) it should be the very best glue that can be bought. (2) Never boil down more than $\frac{1}{4}$ lb. at a time, because it loses its strength by being often boiled. (3) To $\frac{1}{4}$ lb. of glue, in a perfectly clean glue-pot, add half a pint of cold water, let it boil, and then gently simmer till it is all melted. Test it then to see whether it is too thick or too thin; if the former, add boiling water, till when the brush is lifted out of the glue, it runs from it as freely as golden syrup; if too thin, let it boil gently till it is thick enough. (4) Never heat the same water in the kettle twice, *always* clean water, because glue when re-heated always requires thinning, and if you put dirty water into glue it spoils it. (5) Keep a pot of glue for veneering only, and always keep it covered when not in use. Good glue is most essential, as without it you will always be in trouble.

Have your glue boiling, and a sponge by your side, any little old bit will do. Take one of the triangles, and with the sponge, moisten with the boiling water from the kettle the uppermost side of the veneer, but not the side to be glued. This warms the veneer, and prevents the glue from setting too quickly, and also prevents the wood from curling, when heated on one side only, by the glue. Now with a small new brush, about the size of a large water-colour brush, which should be previously steeped in boiling water, to prevent the hairs coming out, apply a *very little* glue; lay the wood in its proper place, and as quickly as possible lay the other half of the diamond against it. Now with the back of the hammer, with good firm pressure, squeeze out all the glue from underneath; it will ooze out at the sides. Care must be taken not to shift the pieces from their places in moving the hammer backwards and forwards. Then with the back of the chisel clean off all the waste glue; hot water must not be used for this, as it is liable to melt the glue, and raise the piece again. Now put on the vertically opposite pair in a similar manner; and then two other opposite pairs, so that you have four pieces on with a space between each. Care must be taken about the colours, to have the "amboyna" and "white" alternating; and in order to guard against mistakes, it is always well to write on each place, the wood that will come there, and there can be no mistake. Now fit the other eight half pieces in. This is easily done, as you can cook them to fit their places; a little irregularity will never be noticed, as long as all the points touch the circle. Now test the whole star, to see that every part of every piece is down. This is done by tapping lightly with a pencil all over it, and the hollow sound of pieces that are not down will at once attract your attention; any of these must be put down in the following manner: heat a washerwoman's iron *hot*. You can find out when it is hot enough by using the laundrymaid's test of spitting on it, and if the water stays on, it must be heated still more; whereas, if it jumps off, you have obtained the required heat. This is a sure test, and never be ashamed of using it, for it is useless to work with a cold iron. Touch the faulty piece, once or twice with the hot iron, and then press it down as before with the hammer; if it does not stick then, it must come up, and a new piece be laid down. You can take any piece up by letting the hot iron rest on it, the glue underneath frizzles, and the piece curls up. Never leave a piece that is not down, or you will scrape a hole there when cleaning off.

It is desirable that I should take the present opportunity to put in a word about the tools, now that you have some idea of the sort of work it is. It is impossible to work with blunt tools. Your knife and plane should be very sharp, and the plane finely set, or you will never turn out decent work, besides wearing out all your patience with corners breaking off.

There is no actual difficulty, as I have said, in the work of inlaying in veneers, and this will be found to be the case by anyone who is willing to go to work carefully, and with deliberation, for inlaying

in veneers is an art which will not fail to illustrate in a very pointed manner the truth of the old proverb, "More haste, less speed," if any attempt is made to hurry through the task in hand, or, in workshop parlance, to scamp the job. Scamping is fatal to the effect and durability of work of all kinds, but especially so to inlaying in veneers. So let those who have a wish to excel in this kind of decorative joinery, for *joinery* it is in every sense of the word, steadily determine to avoid undue haste and hurry.

It is not to the ornamentation of tables alone that this kind of fancy work is applicable. It may be used for the external adornment of any kind of article that is not likely to meet with rough handling or usage, and in positions in which the surface of the article thus ornamented is not exposed to injury or disfigurement from any casual blow. Thus it may be resorted to for the embellishment of work-boxes, desks, cabinets for stationery, and a number of things of this description ; and panels of doors may be covered with veneers, as well as the facia or flat part of the cornice of a book-case. Even a wooden mantelpiece might be treated in this manner with pleasing effect, but the veneering should not be carried on to the plinths on which the jambs of the mantelpiece are usually placed, because the fender is frequently brought into contact with these parts, much to their detriment.

In my next paper I hope to finish the table shown in Fig. 1, and give the necessary hints for making the chess-table in Fig. 2. Any queries with regard to points that may not be fully understood, should be addressed to the Editor for elucidation in "Amateurs in Council," in which department of this Magazine they shall be fully explained.

(*To be continued.*)


FIG. 11.—SCRAPER SHARPENER.


FIG. 6.—MOUNT KNIFE.

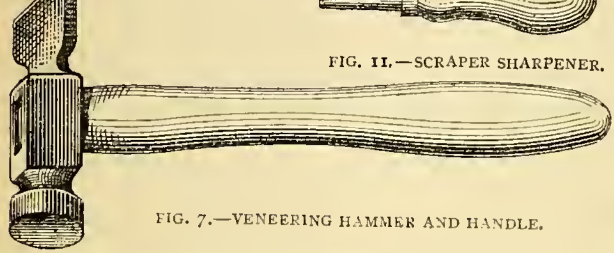


FIG. 7.—VENEERING HAMMER AND HANDLE.

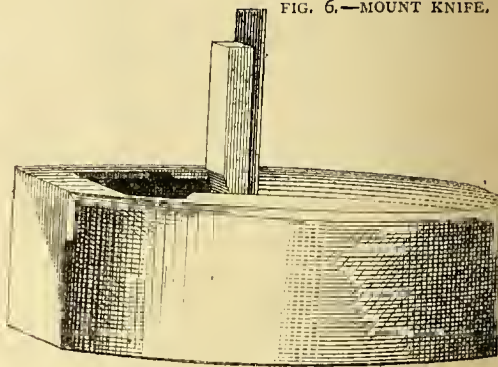


FIG. 9.—TOOTH PLANE WITH FINE TEETH.

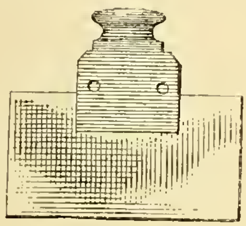


FIG. 10.—SCRAPER FITTED WITH HANDLE.

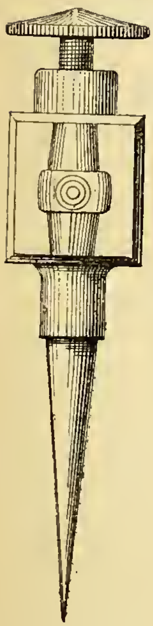


FIG. 12.—TRAMMEL HEAD.

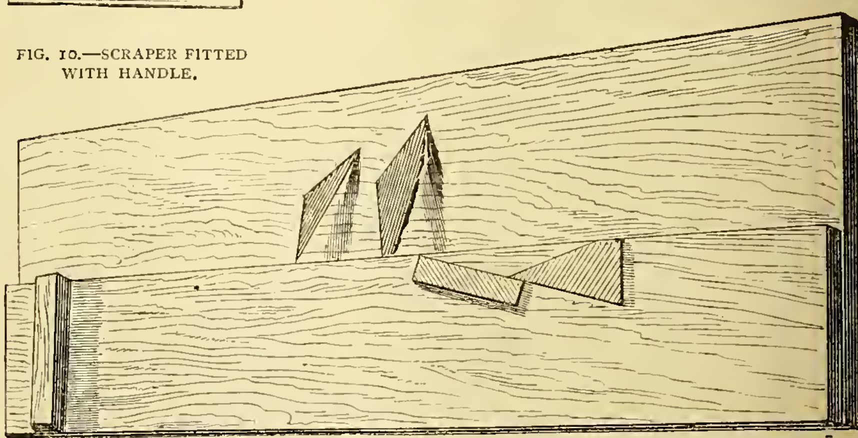


FIG. 8.—SHOOTING BOARD, SHOWING RECESS ON SURFACE FOR PLANING UP PIECES.

THE AMATEUR'S HORIZONTAL FRETWORK DRILL AND AUTOMATON BLOWER.

By J. T. FINCHETTE.

THE two articles enumerated above are, in any form, usually considered to be indispensable attachments to a fret-cutter. All machines are not alike, and what holds good in one variety may not be applicable to another; at the same time, many independent fretcutting machines now being sent out are usually provided witb some contrivance or other, all more or less successful for the purpose in view. But the readers of these pages are not always possessed of unlimited casb, tbat they can readily discard their old tools, and purchase new ones replete with all the latest improvements, that a few hints from any wbo are successful in adding to, or improving, existing ones will, I feel assured, be appreciated. Hitherto I have met witb nothing to meet the wants of those who, like the writer, originally possessing a lathe, have added the fretcutting part to it. True, we have the antiquated gimlet, and various forms of the Archimedean hand-drills; the former, at the best, is uncertain and unsatisfactory, and in delicate work extremely liable to fracture, more especially with hard wood, besides being next to impossible to get a clean cut hole. The latter tool is objectionable, requiring, as it does, both hands to work the drill, while the work must be fixed in a vice, and again moved at every fresh hole—truly a very tedious operation. The article illustrated, Fig. 2, has none of the above objectionable points, its chief claims to notice being simplicity of construction, beauty, and cleanness of the work done by it; and last, but not least, always at hand when wanted, cannot get out of order, and disengaged in a moment by slipping off the short driving-band.

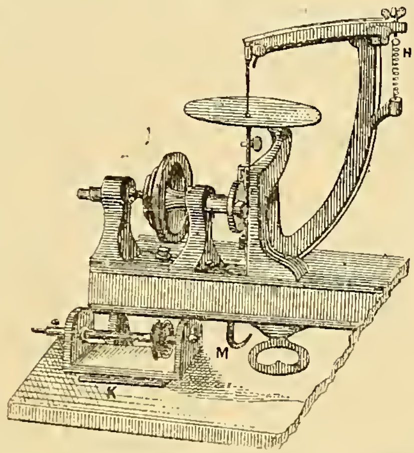


FIG. 1.—MACHINE WITH DRILL, ETC., ATTACHED.

The second article, Fig. 3, is equally useful, more simple in construction, and one that will save a good deal of exertion, and amply repay its cost in an hour, from the increased comfort and pleasure obtained by its use. Every fretcutter will have observed the tiresome little heap of dust that at every stroke of the saw forms in front of the blade, obscuring the design, and, unless kept clear by a continual puff from the mouth, first clogs, then heats the saw, when a breakage follows, as a matter of course.

After many experiments, the writer designed and constructed the little apparatus shown in Fig. 3, which will be found to answer perfectly, with the great advantage of being *instantly* put in or out of action, with no more than a touch of the finger. In the present case, it was designed for use with the Britannia Company's fret-arm appliance, which, as no doubt, many of the readers of this journal may possibly have; if not, I can honestly testify to its practical utility, in my opinion, with the two attachments I have contributed, as one of the best out for general all-round work. Besides having a vertical cut, this will cut inch stuff, and over, easy and accurately as veneers, and at any angle, taking in work over 30 inches in diameter, owing to the long arm given.

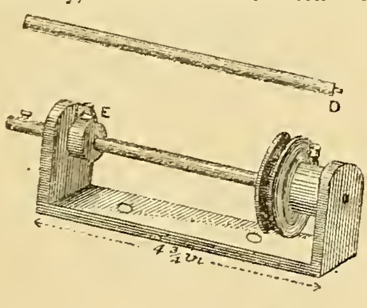


FIG. 2.—HORIZONTAL DRILL.

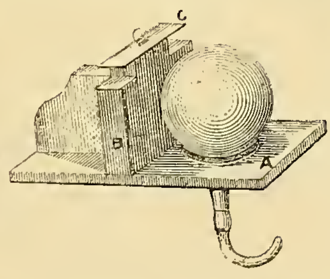


FIG. 3.—AUTOMATON BLOWER.

In the sketch Fig. 1, both the attachments are shown in position, from which it will be seen either can be adapted to any lathe or fretsaw working upon the vertical principle. The drill may be made heavier, according for what purpose it is to be used, and anyone having the run of a smith's shop, or possessed of metal-working tools, will find no difficulty in rigging it up. Take a piece of wrought band-iron, $9\frac{1}{4}$ inches long by $1\frac{1}{4}$ inches broad, and $\frac{3}{8}$ inch thick, bend up at right angles each end, high enough for small pulley to clear the bed, mark the proper height for centres, drill out the right-hand one $\frac{1}{4}$ inch in diameter, the left $\frac{3}{8}$ inch. These are your bearings for the shaft, which turn up 6 inches long, and to nicely fit the $\frac{3}{8}$ inch bearing, turn a flange at one end to fit the $\frac{1}{4}$ inch bearing, D, Fig. 2, drill out

the $\frac{3}{8}$ inch end $\frac{3}{4}$ inch deep, over this drill and tap for set-screw; and here let me suggest having a set of drills up to $\frac{1}{4}$ inch diameter, with the shafts all one uniform size, and let this hole be made accordingly, as from the position of the drill I have found it simply invaluable for dowelling the joints in small cabinet work.

Next turn up the hub, E, $\frac{5}{8}$ inch by $\frac{3}{8}$ inch thick, bore out, tap and fit with set-screw. The pulley is a small casting with the hub on it, which can be obtained from the Britannia Company, *Colchester*, who supplied me with mine, and are ever ready to assist amateurs in any branch of metal work.

By fixing the drill on block of wood, K, Fig. 1, allows it to go closer to side of lathe, and clear the spreading foot of same. Note, when fixed in position, no part of it should project over the side, except the *drill point*, removed in a second, if required. If these instructions are followed, the drill will be found to be quite out of the way of all impedimenta, somewhat contrary to its appearance in sketch. I drive mine by the fourth, or smallest speed, on wheel; and in operation on heavy work or hard wood, lean with the right arm over the lathe gives you both hands free for pressure on the drill. This is, of course, when the fret-arm is removed, as I recommend all holes drilled out at first and done with; the wood being all in one piece is the better able to bear it in the intricate parts.

With regard to the blower, Fig. 3, little of the apparatus can be seen in Fig. 1. That a few words how to fix may be necessary. Every lathe has a hollow space between and under its bed, over which slide the rests and back poppit. It is in this empty space the little apparatus is permanently fixed, and worked by the downward action of the vertical spindle. All woodwork is of mahogany, and anyone can make it from sketch shown, and suit the dimensions to their own particular lathe, the space available not being the same in every case. The flat-piece, A, must, in every case, be cut to fit, and slide just easy, and no more, in the space at command, but the ball need not be any larger. The size used in this instance being just large enough to touch sides when under the pressure. The idea is to box it in, as it were, and so prevent it ever being driven to one side, and so thrown out of action under the working of the spindle. The ball used is what is known as an ear-syringe, procurable at most indiarubber shops, and some chemists. Bore a hole in the wood, A, and fit it tight; on the bone mouthpiece is slipped a short piece of black rubber tubing, three or four inches long. B must fit and slide flush with the edge in the space of lathe-bed; C shows brass plate, and round-headed screw. To fix in position, turn this plate round at right angles to B; the apparatus can then be pushed up under lathe-bed. Turn the brass plate round again, and screw down sufficiently tight for same to slide to and fro; push back against the headstock, as shown in Fig. 1. If properly made, it should then be out of reach of the spindle. To put in action, push the brass plate to the right, about an inch or so, when the ball is carried immediately under the vertical spindle, which instantly acts upon it when the lathe is put in motion, and sends a current of air along the arm in front of the blade, and no dust will ever be seen there.

The rest is merely a question of arranging some fine brass tubing $\frac{1}{16}$ inch diameter, as shown tied on the arm, but at H must be substituted a short length of rubber tubing tied on the ends of brass tubing, on account of the rocking motion of the arm at M. The rubber tube is again simply slipped on to the brass end on lower arm. It will now be seen that once it is fitted one touch with the finger at once puts it in action, or out, and as quickly detaches it from the arm altogether I would suggest that the end of spindle should be somewhat flattened or rounded to avoid injuring the ball in any way.

I hope I have made myself plain; if not, I shall be happy to supply any further particulars through "Amateurs in Council;" and I trust those who fit them up may find them as useful as the writer has.

FISHING TACKLE:

ITS MATERIALS AND MANUFACTURE.

By J. HARRINGTON KEENE,
Author of "The Practical Fisherman," etc.

I.—HOOKS OF VARIOUS KINDS, ANCIENT AND MODERN.

WHEN I began to map out the articles that follow, I had much doubt whether the subject was of sufficient interest to the readers of a journal embracing mechanical topics only, to warrant me in offering them to its conductor. In my difficulty I consulted a valued friend (one of the best anglers of the day), and here is an extract from his reply: "Why not of sufficient interest? Do you know that there are 4117 members of angling clubs in London alone, chiefly of that class yclept 'working men,' and really chiefly comprising artisans of all kinds. Then look at the 117 clubs and societies of the provinces, including those immense organizations of Sheffield! Mr. Wheeldon in his handbook on 'Angling Clubs,' says it is computed that there were not less than 30,000 visitors last year to the waters over which the Boston Angling Association has jurisdiction, and ask yourself if it be possible to number just those people likely to be readers of AMATEUR WORK, who frequent the Lea and Thames during the season." I found myself pondering on this, and have, with our Editor's permission, arrived at a practical conclusion.

Tackle-making is an art by no means difficult of acquirement, if the operator be even as careful in following directions as he would be in connection with the most ordinary piece of carpentry, and in the event of his being an angler, the difficulties are remarkably decreased. With a constituency of perhaps millions who make fishing a dearly-valued sport, the professional manufacturers are few, and the retailers enjoy a comparative monopoly. It is true Messrs. Allcock, of Redditch, employ over five hundred hands in actual manufacture from raw material, but then they supply half the tackle-makers—probably this is far within the mark—of that empire on which it is our boast the sun never sets. Yet every little and big retailer terms himself a maker; and it is for country and town private residences, gorgeous and high-rented shops in busy thoroughfares, and to swell the large balance at the bankers, that each and every angler has to exorbitantly contribute, if he decide to supply all his wants for angling from the tackle shops. I say this fearlessly, because I know the original cost, the comparative easiness of making, and the ultimate prices obtained for goods often of inferior and unreliable make. Many a pound have I saved for myself by the home manufacture of tackle; and it is precisely because I desire to see others doing the like, that I offer these articles to my readers. Of course, everything cannot be made by the amateur, but a large percentage can; and to show to what perfection of manipulative deftness one can attain, I may add that the friend of mine aforesaid, two years ago, had never made an artificial fly, and now is reputed the best maker in Hampshire of those quintessences of daintiness—the Quilled Gnats and the various duns. I shall be pleased to give information in elucidation of these papers to anyone who may be unable to grasp my meaning, or who require fuller information. The subject being so large, I must perforce be severely brief and practical.

So much by way of introduction, and I may be forgiven if I further preface the subject with a few remarks on the history of fishing tackle in the past. Hooks were certainly in use when the Book of Job was written, and Isaiah also makes unmistakable reference to these implements also. Egypt seems, however, to be the only nation to which one can turn with a certainty of finding proofs that the angler existed in ages before Christianity. Bronze harpoons and fish hooks still exist to show that this was so. An Egyptian tomb, built, according to Mr. Adams, as early as the seventeenth dynasty, contains a representation of two men angling, with the hieroglyph of fishing inscribed above them. Net-casting, fishing with comorants, or a bird resembling them, are all represented on various monuments; and it is known that fish culture was well understood by the ancient Egyptians. To pass to a later period of this "China of the western world," who is there who does not remember the exquisite joke detailed by Plutarch and dramatised by Shakespeare ("Anthony and Cleopatra") wherein the swarthy queen "brow-bound with burning gold" sent her diver down to put a salt fish on the unlucky Roman's hook, which "he with fervency drew up." In classic times Oppian published his great poem on fish and fishing, and I thus mention him to simply say that he was probably the first to indicate a weapon like our present gorge hook used in pike fishing. These are the words—

"He holds the labrax and beneath its head
Adjusts with care an oblong piece of lead
Framed from its form a dolphin, armed with this
The bait shoots headlong through the blue abyss,
Till some dark form across its pathway flit,
Pouches the hook, and finds the biter bit."

The gorge hook, as the reader will see hereafter, is specially constructed for manipulation as here indicated.

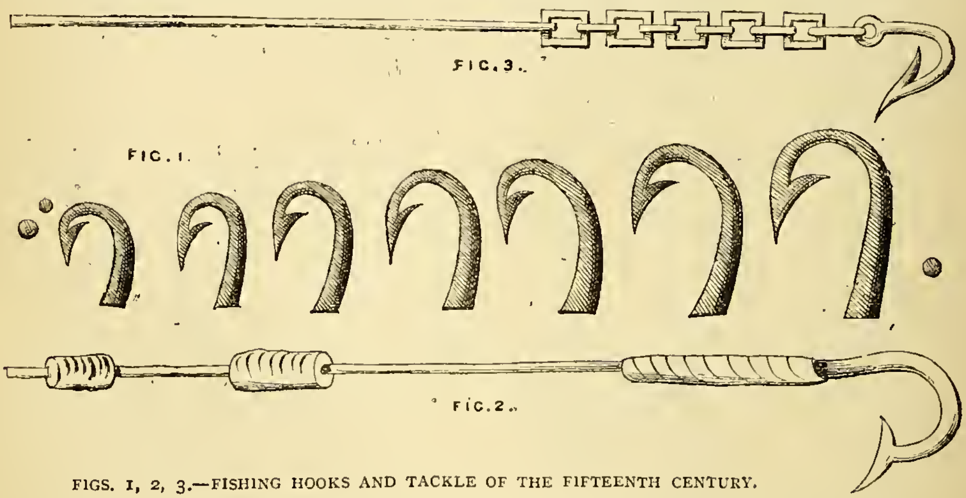
So far as English anglers and tackle-makers are concerned, however, the art practically commenced with the publication of the "Treatyse of Fysshynge with an Angle," by the fair prioress of Sopnell, near St. Albans, in 1496. This Diana of England tells us frankly that hook-making is the most difficult art, and she figures in the quaint old-world style, the shapes and sizes. I have copied the engraving as a curiosity, so that when I come to speak of the hooks of to-day, the form of which is shown in Fig. 4, the reader may compare the advance. Fig. 1 is an exact facsimile from the "Boke," and they are directed to be made by means of several tools, also figured. These include a file, hammer, anvil, and a pair of pincers, like the horns of some night-mare black stag beetle. How fish could ever be reconciled to be taken by such impracticable weapons, I as an angler cannot divine.

Figs. 2 and 3 also show her so-called "rennynge" (running) line, with the hook attached. The tyro will be astounded to notice the advancement in neatness and delicacy since that day when it seemed necessary to use such terrible engines. They seem rather to belong to that species of fishing chronicled in the rhymes:—

"For angling rod he took a sturdy oak,
For line a cable that in storms ne'er broke;
His hook was baited with a dragon's tail,
And then on rock he stood to bob for whale."

As I shall show in the chapter on fly-making, equally absurd flies—"woll donnes" (wool duns) were in use. These, however, do not seem to have been quite so rudely made as the hooks furnishing a part of them. Rod-making was of an extraordinary character, and just for the sake of quoting a curiosity of

mechanical direction in this introductory chapter, I shall give the words of the good Dame Berners from the celebrated "treatyse" itself:—"And how ye shall make your rodde craftly I shall here teche you. Ye shall kytte between Mychelmas and Candylmas a fayr staffe of a fadom and a halfe long and arme grete (size of one's arm), of hasyle, willowe, or aspe, and bethe hym in an hote ovyn, and sette hym evyn, then let him cole and drye a moneth. Take thenne and frette (tie about) hym fast with a cockershote cord and binde hym to a form or an evyn square grete tree. Take thenne a plumber's die that is evyn and streyte and sharpe at one eynde, and hete the sharp ende in a charcoal fire till it be whyte, and berrne the staffe therewyth through eyver streyte in the pyth at both endes till they mete, and after that berrne him in the nethyr ende wyth a byrde broche (bird spit), and wyth



FIGS. 1, 2, 3.—FISHING HOOKS AND TACKLE OF THE FIFTEENTH CENTURY.

other broches, each grater than the other, and even the gretest the laste, so that ye make your hole aye taper nere. Thenne let him lye stille and kele two dayes; unfrette (untied) him thenne, and let him drye in a hous rofe in the smoke till hee be drye. In the same season take a fayre yard of green hasyle, and bethe him even and streyghte, and lete it drye wyth the staffe; and thenne whenne they be drye make the yard mete into the hole in the staffe, and to performe that other half of the croppe, take a fair shoote of blacke thorne crabbe tree, medeler or of jenypre, kytte in the same season, and wel bethyd and streyghte and frette (tie up) them together fetely, so that the croppe may just enter into the sayd hole, then shave your staffe and make him tapre well, then vyrell (ferrule) the staffe at both ends wyth long hopis of yren (hoops of iron)."

The illustration of this notable weapon it is hardly worth while to reproduce here; but I may say that it pourtrays an exceedingly rough walking-stick-like implement, of a make quite strong enough to summarily land any fish known now. Of this the reader, however, may be well assured, seeing that it is as thick as one's arm, and bound about with "hopis of yren."

I do not know that I should be doing any good by prolonging the slight account I have given of ancient tackle, nor by tracing the developments which the last four centuries (nearly) have produced in the general outfit of the angler. A pretty fair idea can be gathered of its condition at the time when the first volume on fishing was produced in England, and the successive refinements — which, curiously enough, seem also to have so refined the fish as to have become necessities—would be of no practical use to the tyro. Isaak Walton, in his "Compleat Angler," gives us valuable hints as to tackle manufacture, though, to be sure, that which he possessed was no doubt in tolerably good case by 1653, the date of the publication of his book. He quotes an old rhyme as being sufficient in its enumeration, though of course it could hardly have been so:—

> "My rod and my line, my float and my lead,
> My hook and my plummet, my whetstone and knife,
> My basket, my baits, both living and dead,
> My net and my meat, for that is the chief;
> Then I must have thread and hairs, great and small,
> With mine angling purse—and so you have all."

Especially is it supposed by some writers that hooks had greatly improved, for in some editions Walton mentions a maker whose name is even now well known, as applied a particular make and shape—I mean Kirby. It is said that Prince Rupert communicated the secret of tempering them, to one of this name during the troublous times of King

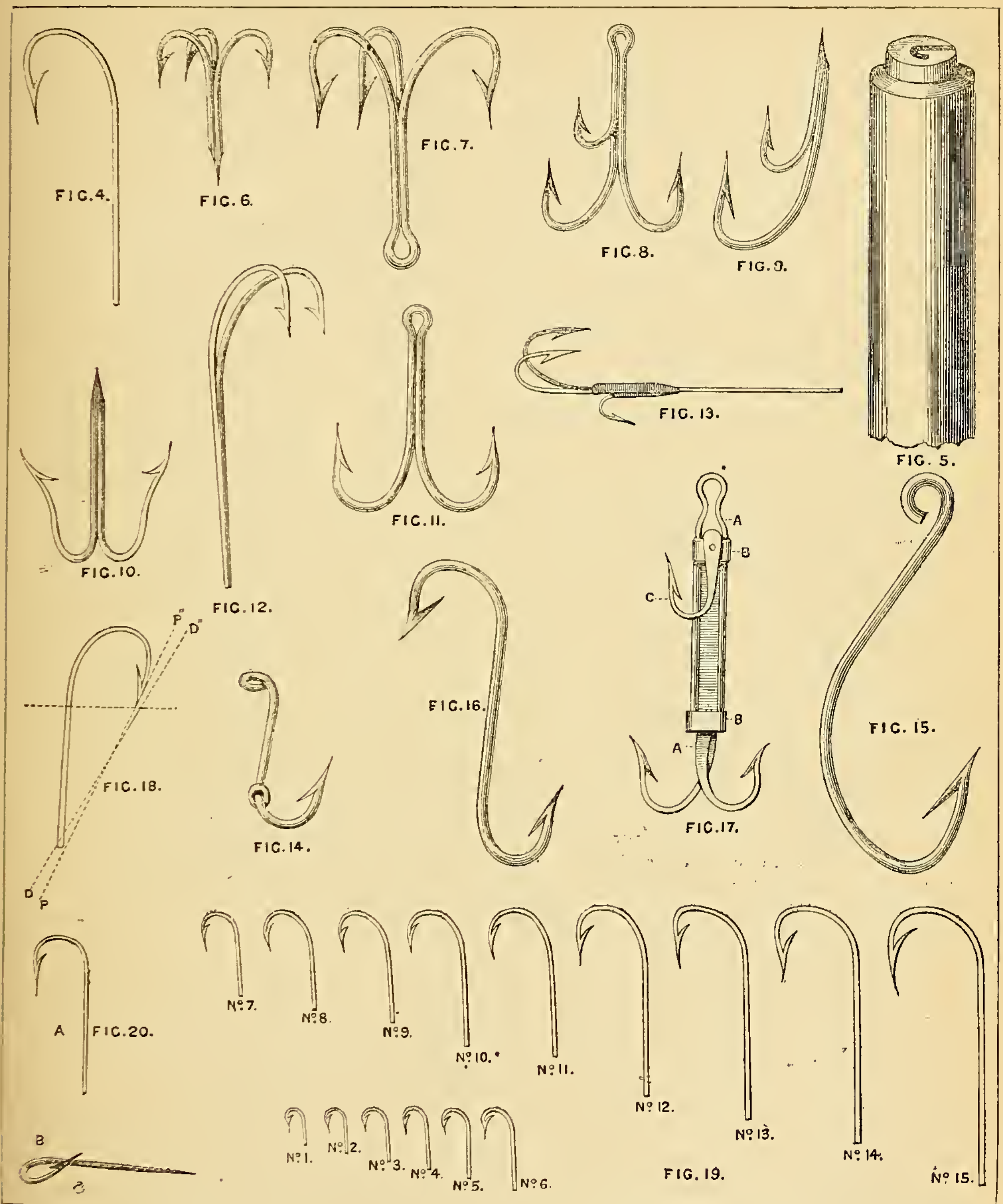


FIG. 4.—MODERN FISH-HOOK, "KIRBY" SHAPE. FIG. 5.—MOULD FOR SHAPING HOOK. FIG. 6.—ORDINARY TRIPLET. FIG. 7.—TRIPLET FOR ARTIFICIAL BAITS. FIG. 8.—TRIPLET FOR PIKE AND "SNAP" FISHING. FIG. 9.—DOUBLE HOOK FOR LIVE BAIT. FIGS. 10, 11.—HOOKS USED IN "BED BAITING." FIG. 12.—DOUBLE HOOK FOR "SNAP" FISHING. FIG. 13.—DOUBLE HOOK, WITH THIRD HOOK ATTACHED AT BACK. FIG. 14.—NEW MAKE OF LIP HOOK. FIG. 15.—COD HOOK, ACTUAL SIZE. FIG. 16.—BACK HOOK. FIG. 17.—OLD-FASHIONED SNAP LIVE BAIT HOOK. FIG. 18.—AUTHOR'S IDEAL OF HOOK. FIG. 19.—SIZES OF HOOKS GRADUATED FROM NO. 15 TO NO. 1. FIG. 20.—SNECK BEND HOOK—A, PLAN; B, ELEVATION.

Charles I., and that so late as 1760 one of the family was living, having preserved the secret. The Prince, however, has a rival in the great architect, Sir Christopher Wren. If the latter invented the better tempering, it is nevertheless certain that the German prince greatly improved both the shape and material of his day. Fig. 4 shows the "Kirby" shape as now made, though of course the processes are widely different.

No angler of the present day attempts the making of his own hooks from economical motives. In the time of the good Dame Berners, of course, no choice existed—either the angler fitted out his tackle basket from beginning to end, or he didn't go fishing. At any rate, from the specimens of hooks of that day it is tolerably clear there were few wholesale makers of very advanced skill.

Yet it is remarkable, as showing the actual development of mechanical skill, that the whole of the ten processes necessary in the perfecting of a modern hook of ordinary make, are carried out purely without self-acting machinery, and the qualities, therefore, of each hook are directly the result of the handicraft of the workmen. The selection of the steel is purely one of personal experience in reference to its either being good or bad, and though each stage in the manufacture of a hook is reduced to its minimum of complexity, yet the labourer must be skilled—in fact, the making of a hook from the time it exists as steel wire only till it is turned out packed in hundreds is a chain which is like every other, no stronger than its weakest link; or, to put on one side metaphor and speak plainly, such a hook is good or bad according to whether all have done their work well in its production or have not. Let me advise the would-be tackle-maker never, under any circumstances, to omit trying his hooks, and on no account to use one that is too brittle or too soft.

I am not aware that the process of hook-making has ever been described in detail before, that is as it is carried on in that great centre of needle and fishing-tackle making, Redditch. By the kindness of Mr. S. Allcock I recently had an opportunity of witnessing the whole process as carried on at the Standard Works, and it is probable that a more interesting operation does not exist. Shortly, it may thus be explained. The wire used in river hook-making is chiefly Swedish and of cast steel, varying of course in gauge, according to the requirements of the hook to be made. The various stages are as follows seriatim:

First. The operator takes a number of wires; and the correct length being arrived at, he quickly and sharply cuts them into lengths with a large pair of shears. The metal being in its soft state this is not a laborious job, but seems to be performed with ease, this may however arise from long practice.

Second. A number of the shafts thus prepared are arranged horizontally side by side on a plane surface with their right hand ends against an upright. A knife, ground hollow, is now drawn against the shafts, and the beard or barb is thus formed, which by a slight turn of the knife is turned open. We have now straight shanks or shafts, with a beard or barb and no point.

Third. The points are now carefully filed by men and boys. Using a pair of tongs made specially to hold the wire, and rapidly turning the same, they put a point on it instantly. In the case of bayonet-pointed-hooks this process, of course, takes a longer time, but the round form of point is easier to obtain. A little wooden block is placed at the bench in front of each filer, and it is surprising what a quantity each child I saw could turn out per hour.

Fourth. This stage is very interesting. It is now necessary to give the hook its form, and for this purpose the boy or girl operative holds a mould mounted on a wooden handle, fashioned like the pot hook of of our copy-books. With one deft movement the beard is hooked round the shorter end and a quick turn brings the shank straight with the shank of the mould. Fig. 5, imperfectly shows the *tout ensemble* of the little tool. The mould consists of steel let in the wood and there fixed rigidly.

The Fifth process, when the hooks are of the kind intended for sea or eel fishing, consists in flattening the end of the shank. This is accomplished by means of a small anvil fixed into a block of some hard wood, the boy striking the shank with a hammer. The hooks with which the inland fisherman has to deal, do not include this kind however.

Process Six is a most important, and it consists of the hardening of the hitherto soft steel hook. Mere description will not suffice to do justice to this stage of hook manufacture. The heat required for each style and size of hook varies; and, as I before hinted, there is all the difference between a hook too hard or too soft. In the former case, immediately it is struck against the hard jaw of a fish, it flies, either going at the bend or at the point. Nothing is more irritating to the trout fisherman than to find the fish pricked and gone, and the point also minus, and this not discovered possibly till he has hit, and as he thinks by some fault of his aim missed the rising fish. The best hooks are those which are tested and found of perfect temper, and they are, of course, of the best price. Those which by some mistake or accident, or unavoidable chance are not deemed A. 1, are sold at a considerably less price. These go to those tackle-makers, whose flies, etc., are cheap—very cheap, and often equally nasty. At Messrs. Allcock's I was surprised to find that the hardening medium was

cod liver oil. The huge vat into which the hooks fall had a most unpleasant, but I was told a most beneficial fragrance.

The Seventh process is, of course, the tempering. The hooks are let fall on a fine wire sieve in the cod oil before referred to, and are thence taken and together with fine silver sand, are mixed and turned about in a frying pan kind of receptacle over an aperture like that of a kitchen range, beneath which is a charcoal fire. Ever and anon a hook is picked out and tested, and as soon as one lot is deemed sufficiently soft, it is passed on one side, and another takes its place. Of course the experience of the operator dictates the finish of each parcel, and the man is always selected from those of the highest capabilities, both as regards fish-hooks and needle making.

Eighth. The polishing is the next on the list, and this is performed in two ways. I believe I am right in saying that the following is the process for the best and smallest river hooks. They are placed in an oblong bag with fine emery powder, and one man taking one end and another the other, they are rapidly shaken end to end, until the dusky colour caused by the tempering, etc., is rubbed off. The other way is to place them in barrels moving more or less rapidly round on their bases, *inclined at an angle* of 45° from the perpendicular. It is found that this inclination has a greater and more certain effect toward the end in view, than an upright or horizontal position would have. They are next washed, if this be necessary to remove the emery, and dried in saw-dust.

Ninth process. This is termed japanning, and as each firm has its own special method, it is not to be expected that I can give it. The ordinary blueing is found on some hooks, others are left bright, others are black with, as it were, a thick coating of black varnish. The best tint is that produced on the browned hooks of Mr. C. Court of Redditch, who is now with Messrs. Allcock, samples of which I have had in use for a long time. They never corrode, and are practically unseen by the fish.

The Tenth process is the very ordinary one of counting, and papering, and packing, which is ordinarily done by girls who take up the hooks with a knife and balancing them on its edge, turn over their hundreds with incredible speed—indeed, throughout the Standard Works at Redditch, the speed attained by the nimble and deft fingers of the girls was incredible. On the occasion of my visits the absence of *visible* supervision in this vast establishment was a source of continual wonder at the splendid administrative and kindly ruling of the chief, Mr. S. Allcock. This is a feature I cannot omit to refer to.

The patterns of hooks in use by the British tackle-maker, are many in number, and consequently it is obvious that this brief description will not exhaust the processes which apply to triplets, the spring snap, nor to eel hooks with a ring for the reception of the line at the end. Some, and indeed the chief of these varying kinds of hooks are represented, and perhaps this will not be a bad opportunity to draw attention to them with a view to familiarizing the tyro with the kinds he will be called on hereafter to refer to and use.

Fig. 6 shows the ordinary triplet which is made in all sizes according to the scale given in Fig. 18 for single hooks. This is used in trout, perch and pike flights, etc. Fig. 7 is a similar make employed on artificial baits; the ring admitting the entrance of a split ring, split swivel, etc. Fig. 8 is another kind of triplet used in the "snap" flight for pike. Fig. 9 is chiefly employed for live bait tackle for trout and perch. Figs. 10 and 11 are also hooks used in live-baiting, and the deadly trimmer for pike. Fig. 12, in conjunction with a single hook as in Fig. 13, is also used for snap fishing. Fig. 14 indicates the new make of lip hook on the "Pennell" flight. Fig. 15 shows a cod hook, natural size; and Fig. 16 the "back" hook also of Pennell's flight. Fig. 17 is the old fashioned snap live-bait hook, and needs a little further explanation as it is unlikely I shall again have occasion to refer to it. A A consists of a double hook all in a piece, and made so as to spring asunder if force be applied to the upper loop; B, B, are hollow and fixed to a slight framework of steel, with a hook fixed at the upper B, and shown as C, to which the bait is hooked. The action of the hook is simple. When a fish (pike, etc.) has seized, a stroke is made by the angler, B, B fly up, leaving A and its companion hook (now tightly closed) wide open, of course the "biter is then bit." This arrangement is supposed to be very deadly, but it is seldom used now except by the most antiquated fishermen.

All the before-named hooks will be used and designated in the chapters that follow, so I advise the reader to preserve the Parts containing these articles carefully, as frequent cross references cannot but be made to make the subject intelligible.

The choice of a pattern of the ordinary single hook is a matter of supreme importance to the angler, and necessarily so to the tackle-maker or the fisherman's servant. The desiderata in a hook are broadly —penetration, holding power, lightness, and strength. Of this there can be no question. Penetration, of course, means that when a fish is struck, the direction of the line of impact should be almost identical with the direction of the force applied, and that the point should be as sharp as possible, that the minimum of force may be lost only.

Fig. 18 shows my ideal of a hook which Messrs. Allcock are producing, with bayonet points and

needle eyes at the end of shank, for attachment without whipping, when this is desired. D D indicates direction of force applied ; P P indicates the point of impact. It will be seen that the lines are within a trifle of being identical, and I don't doubt but they might be made quite so. My drawing is not so exact as it should be, but it sufficiently explains my meaning. Now the *holding power* abides in the extension of the barb and the minimum of distance between the barb and bend opposite, as indicated by the dotted line drawn across. If the barb be long, and proportioned in its "openness" to the distance between point and bend, so that they be not antagonistic to each other (when the point has entered the fish, by reason of not sufficient room being given), then I conceive such a hook is theoretically, and if these rules be carried out, of course practically, perfect. Lightness and strength are of course extremely necessary —in fact, more necessary than any other essential, especially when trout-fishing is on the *tapis*. These, however, are qualities about which there is no sort of theory, being patent to all on the face of the subject. Alas ! tackle-makers systematically forget it, however. Fig. 19 represents as nearly as is possible the size and shape of the hook I deem the best. The bayonet barb is not shown, however, nor is the needle eye. Both are optional. The sizes are the same as those of Mr. Cholmondeley Pennell, and conveniently graduate downwards to 1. Smaller sizes can be obtained.

There are other kinds of hooks which find favour at the hands of various makers, but I prefer the above-named. The Sproat, Sneck, Kendal, Crystal, Kirby, and Round, are the chief. Of the Sneck bend, one remark should be added. Fig. 20 shows its plan and elevation. The hook is turned to one side in the mould, so that it is, in technical parlance, "rank" on one side. Palpably, therefore, when a fish takes the bait, it is in greater chance of fouling the point. This "rankness," in my opinion, however, injures the penetration. However, the hooks shown in Fig. 19 can be made in this way, if desired.

(*To be continued.*)

PHOTOGRAPHIC APPARATUS : ITS PREPARATION AND CONSTRUCTION.

By J. POCOCK.

I. SIMPLE CAMERA AND DARK-SLIDE.

IN the three articles already published upon this subject, directions have been given for the manufacture of a thoroughly good camera and dark-slide ; and the further directions for polishing, which Mr. Parkinson stated he would give in the next article, are no longer necessary, that subject having been fully treated in the excellent series of articles devoted especially to it.

It occurs to me, however, that the camera and dark-slide already described will be rather beyond the powers of those amateurs who are not already efficient in the art of cabinet work, and who, moreover, do not also know something of the construction and use of photographic apparatus in general. Accordingly, before proceeding to describe the other apparatus more or less necessary to a complete photographic outfit, I purpose giving directions for the manufacture of a camera and dark-slide, so simple in their details, that the veriest tyro at carpentry may set to work with the hope that he will turn out something which will not only enable him to take photographs, but will also afford him such practice in camera-making as will enable him to construct the more finished and perfect apparatus.

The camera I am about to describe has, in its most simple form, no arrangement for focussing, and should not therefore be larger than the quarter-plate—that is, the ordinary carte-de-visite size. This and the fact that it has no swing back or rising front, are its disadvantages ; while its advantages are that it weighs only eight ounces, and measures only $1\frac{1}{4}$ inch by $5\frac{1}{2}$ inches by $4\frac{1}{2}$ inches when closed, so that it may easily be carried in an ordinary coat-pocket ; moreover, it is very easy to make, and, above all, may be quickly finished, thus satisfying a very general requirement in amateur work, while in a later paper I shall show how focussing arrangements and a swing back may be added, although, of course, this will render the camera rather more bulky and complicated.

The tools necessary, beyond those generally to be found in an amateur's workshop, are few. If possible a circular saw must be obtained, and if a lathe forms part of the plant, I should certainly advise the amateur to get one of these useful little tools, should he not already have it among his accessories, before commencing photographic apparatus construction. At the shops the price of a 4 inch saw will be about 4s. 6d., and the spindle, which, however, may be easily made at home, will cost another 6s. They may often be picked up at the second-hand shops, and in fact the writer of this paper bought a few weeks ago at a second-hand tool shop in London, a 5 inch saw with brass spindle, all complete, in perfect condition, for 4s. Should a circular saw not be available a plough will be absolutely necessary; it should have one $\frac{1}{4}$ inch iron and another as small as the iron guide will allow. Besides this, one of the "Griffin's Mitring Machines," noticed in p. 275, Vol. III. of this Magazine, should be obtained, but it must be of the newest pattern, price 4s., not the 3s. 6d. one, in which two screws in the

bed-plate prevent the work lying true and level. It will be seen later on that this little machine is available for purposes for which a shooting-board, or one of Booth's larger machines would be useless.

And now being provided with tools we will set to work, first, for the reason given in the former articles, upon the dark slide. For both this and the camera well seasoned mahogany or walnut wood should be used, but both articles may be successfully made of

This will leave $\frac{1}{4}$ inch of solid wood on each side, from which the other grooves, B and C, each $\frac{1}{8}$ of an inch deep, will take just the centre third.

In the other two pieces instead of the centre groove (A in Fig. 1) a rebate (A in Fig. 2) is to be cut, leaving $\frac{1}{4}$ inch of wood on one side only, in which a groove, B, is to be cut, as in the first piece, a groove (C, Fig. 2) is then to be cut in the rebate, exactly the same distance from the edge as, and corresponding

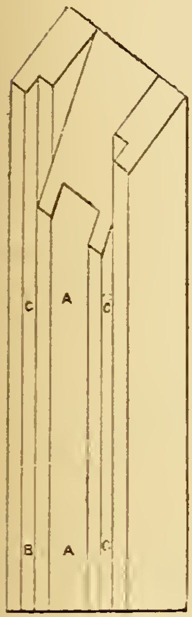


FIG. 3.—END OF SIDE, SHOWING MITRING.

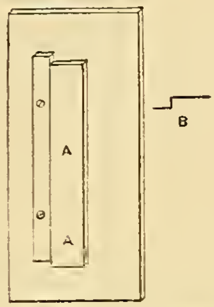


FIG. 5.—PLATE OF METAL BETWEEN GROOVES.

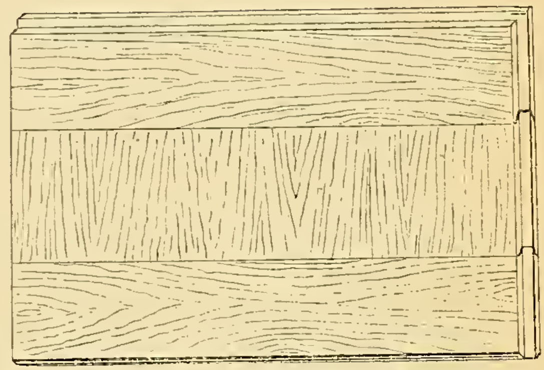


FIG. 7.—SHUTTER OF PIECES TONGUED AND GROOVED TOGETHER.

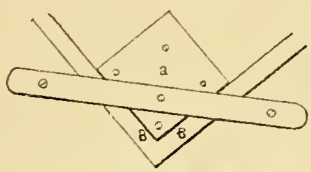


FIG. 6.—DIAGRAM SHOWING METHOD OF GLUING AND KEYING CORNERS OF FRAME.

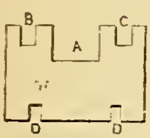


FIG. 1.—GROOVING FOR LONGER SIDES OF FRAME.

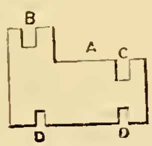


FIG. 2.—GROOVING FOR SHORTER SIDES OF FRAME.

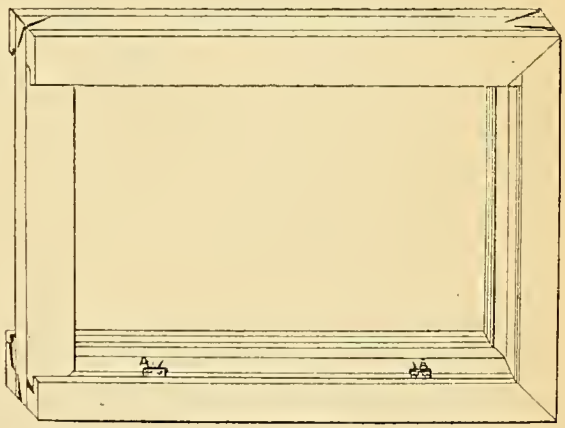


FIG. 4.—FRAMING OF DARK SLIDE, COMPLETE.

oak or even of good yellow deal, but the latter wood must be used so much thicker that the camera when finished will, of course, look much more clumsy.

Well, we will suppose walnut to be the wood chosen; then take two pieces $5\frac{1}{2}$ inches long and one piece $4\frac{1}{2}$ inches long and $\frac{7}{8}$ by $\frac{5}{8}$ of an inch square, and plane them up true. When planed they should be rectangular, and should measure exactly $\frac{3}{4}$ by $\frac{1}{2}$ inch. One of the longer pieces is then to be grooved either with the circular saw or the plough, as shown in section in Fig. 1, the centre groove A, which will take the plates, being $\frac{3}{16}$ of an inch deep and $\frac{1}{4}$ inch wide.

with, the groove, C, in Fig. 1. The grooves, D, D, may be cut now or left till the slide and camera are finished, the latter plan is the best; they are simply saw-cuts $\frac{1}{8}$ of an inch from each side, measuring $\frac{1}{8}$ of an inch in depth, and about $\frac{1}{16}$ of an inch in width.

The two longer pieces are now to be cut in a mitre-box, or one of Booth's machines, at one end, the other ends being left square. Care must of course be taken that the mitres are cut so that the grooves in the two pieces, will be on the inside, the mitres being cut at the lower ends, as seen in Fig. 4. These pieces are for the sides of the dark-slide and should be $5\frac{1}{2}$ inches,

outside measurement, when finished. The shorter piece, which will form the lower end of the slide, is to be mitred at both ends, the outside measurement when finished being 4 inches. Another piece must now be cut for the top, this should be $\frac{1}{2}$ inch deep, and when the mitres are cut at both ends the outside measurement should be 4 inches, that is to say, exactly the same length as the piece for the opposite end, and it should be just wide enough to fill the space between the grooves B, C in the side-pieces, that is, just $\frac{1}{3}$ of an inch.

Now the top ends of the side-pieces might also have been mitred, in which case the frame would now be put together. The necessary saw-cuts made, say two for each corner, and the corners glued up and keyed, small grooved corner-pieces being glued on to fill up the spaces left at the top corners on each side in consequence of the top piece not being so wide as the others; but the following method will, I think, be found a far better way of putting in the top piece, and this is where Griffin's small machine comes in so specially useful.

Between the grooves of the machine a plate of metal, about $\frac{1}{16}$ of an inch thick, and 3 inches long, is placed in the same position as that usually occupied by the broad chisel supplied with the machine. This plate may have screwed to it a strip of brass as shown at A, and in section at B, Fig. 5, to act as a guide to the narrow chisel to be used with it. The square ends of the side-pieces are to be cut away roughly between the grooves to an angle of 45°, and to be finished off with a narrow chisel placed in the guide in the machine. The guide is convenient, but not really necessary, as with proper care very good work may be done with the plate only placed between the grooves as a guide for the angle, the chisel being kept down upon it by the fingers. Fig. 3 is a drawing of this end of one of the sides when finished.

The frame may now be glued up and keyed at the corners. A very convenient way of performing this operation is by screwing on to the bench, or to a flat piece of board, a small square block of wood $\frac{1}{2}$ an inch thick and about 2 inches square, this will insure the work being truly square, the two pieces are held together by a long piece of wood which crosses them, and is screwed down with three screws, one in the middle and one at each end. This arrangement is shown in Fig. 6, A being the square piece of wood and B the work.

Fig. 4 shows the frame finished. A, A are two small pieces of brass wire, a screw is tapped on one end of each piece, and they are screwed into the frame and then bent up as shown, a little recess being cut in the frame at the side of each, into which to turn it down, these pieces are for keeping the plates in position.

The shutters, one of which will be $\frac{3}{16}$ of an inch wider than the other, may each be made of one piece of mahogany, a rebate being cut at each side and at one end, but a better plan is to make each of three pieces tongued and grooved together, as shown in Fig. 7. The shutters should project a quarter of an inch outside the frame when pushed in, and a small slip of wood $\frac{1}{4}$ of an inch wide and $\frac{1}{8}$ of an inch thick is glued on, on the inside of the projecting end. This will afford an additional guard against the entrance of light when the slide is closed. A fine slip of wood $\frac{1}{16}$ of an inch thick and $\frac{1}{8}$ of an inch wide is to be glued on to the inside of each shutter, $\frac{1}{8}$ of an inch from the other end—*i.e.*, just clear of the rebate—after it is in place in the frame, so that the shutter may not inadvertently be drawn quite out. The whole may now be gone over with a steel scraper and put on one side while we proceed with the camera. Unless the amateur is very sure of his work, he will find it a good plan to make the top piece of the frame slightly thinner, so that a piece of velvet may be glued on each side of it; and if this is done, and the rebate in the shutter is not cut too deep, it will be found easy to render the slide thoroughly light-tight.

For quarter-plate slides a hinged shutter is not necessary, but if it is preferred, the way to put in the hinge will be found fully described in the papers which have already appeared.

Of the illustrations, Figs. 1, 2, and 3 are full size, and Figs. 4 and 5 are half size, 6 and 7 are not drawn to scale; Fig. 3 is an isometrical drawing, and Fig. 4 is a perspective drawing.

(*To be continued.*)

HANDY WORK IN FARM AND GARDEN.

By GEORGE EDWINSON.

I.—INTRODUCTORY—BUILDING AND REPAIRING TURF AND QUICK-SET HEDGES.

THOUGHTFUL and observant persons, who have lived both in town and country, or who pass one part of the year in the former and another part in the latter, cannot fail to observe that, generally speaking, farmers and their labourers are "looked down upon" by the conceited habitants of town and city, who think that any shopkeeper can manage a farm, and that any ordinary workman can perform the duties of a farm-labourer. This conceit is bred of ignorance, and would be soon taken out of a town egotist were he put to guide a plough, reap a sheaf of corn, load a waggon with corn, or build or thatch a stack. The chances are ten to one that the furrow would be disgracefully crooked, the sheaf of

corn would be stained with the blood of cut fingers, the load of corn would fall off as soon as the waggon moved, and the builder with his stack would come to grief. And yet these are all the ordinary jobs of a farm-labourer, and work that can only be efficiently performed by a man who has had several years' training on a farm. The writer of these papers has had such a training, and although now employed in an entirely different kind of work, and habituated to city life, he knows enough of agricultural and gardening work to say that it requires as much technical education to be an efficient farm-labourer, as it does to become a good artisan or mechanic.

In farm work, as in other vocations, a man's value rises with his knowledge and his ability, and he who can turn his hand to any kind of work required to be done on the farm, commands a higher rate of wages than the man who can only drive a pair of horses in a plough or waggon. Here and there men will be found who are handy with any kind of tools, and can do anything from the most unskilled labour up to the skilled work usually performed by such mechanics as carpenters, smiths, wheelwrights, and machinists. It is of such and to such men that I write in this series of papers, and the work that such handy men may and will do, I may fairly style "Handy Work in Farm and Garden." Whilst describing the various kinds of work to be done by the handy man, I shall be assisting aspirants to that coveted position, shall be helping those who are driven by stress of circumstances to do this kind of work on their own farms, possibly I may furnish colonial readers with a few wrinkles and hints, and some of these may not be unacceptable to men already occupying the post.

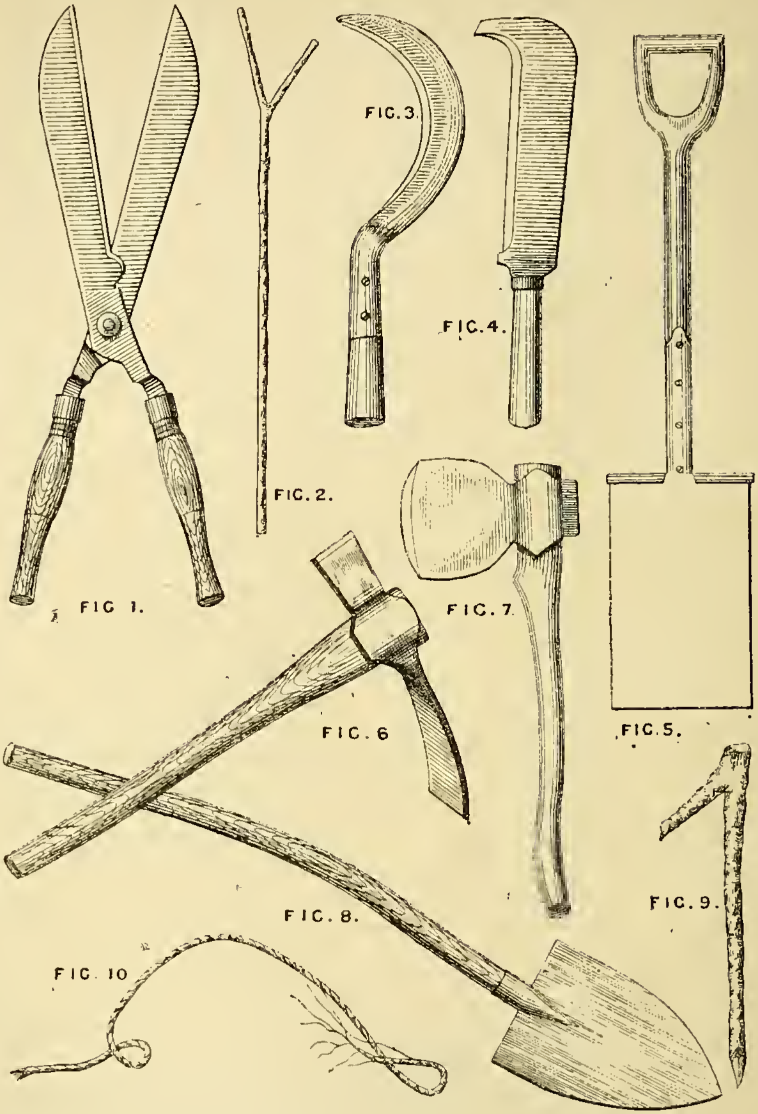
Hedging and Fencing.—Each season brings its proper work to be done on the farm, and even the darkest and coldest days in winter have to be filled up with tasks that cannot be put off to a more convenient time. When the leaves have been swept off the bushes and trees by the wintry blasts, defects and holes appear in hedges and fences, and these must be repaired whilst they can be plainly observed, and whilst living fences are in a state of winter rest. Living fences are those formed of stunted bushes, such as the white or hawthorn, privet, holly, beech, blackthorn, and dwarf oak. The first three of these form the best and most durable quick-set hedges. Thorn and privet hedges should be neatly trimmed before the fall of the leaf, in order that the wounds may heal up before frost assails them, and privet bushes may put out a few young shoots.

The tools employed for garden hedges of privet or thorn are the stout shears shown at Fig. 1, and the hedge hook shown at Fig. 3. The shears are employed to cut the young and tender shoots on top and by the side of the fence, and the hook comes into use when stouter and older wood requires to be cut away. The hook alone is used on farm and boundary fences, and when employed for high hedges by the side of roads, it is furnished with a long handle made of ash. For extensive operations along many miles of highway quick-set hedges, hedge-paring machines are employed, not the least ingenious being one made by Messrs. Hornsby, *Grantham.* A considerable variety of taste exists in the choice of a hedge-paring hook. Some workmen will contend that a common "bagging" hook, as used for reaping wheat and cutting weeds, is all that is necessary for the purpose, but I give it as my opinion that the bagging hook is only suitable for the lightest work, and is a treacherous tool for hedge-paring, since it is liable to be broken by a concealed dead stump or a stone, and may at any time come out of the handle. The hook shown in my sketch is a curved blade of $\frac{3}{16}$ inch steel and iron: that is, an iron back with a broad cutting edge of steel. The iron of the back is extended down to form a socket for the handle, and this socket is pierced with two holes for screws, to hold in the ash handle. The length from point across to hilt or heel does not exceed 1 foot, and the widest part of the blade from $2\frac{1}{2}$ to 3 inches. Any village smith can make such a tool, and I have proved it to be superior to all others for all light hedge work, whilst it is strong enough to be used in faggoting, and in trimming brushwood from trees. A pair of stout leather gloves is almost indispensable as a protection for the hands from thorns and brambles, and a pair of stout leather leggings will prevent thorns from tearing trouser legs, and, when to these is added a forked stick (Fig. 2) of ash or hazel, to be held in the left hand, and used to push away the thorns and brambles as they are being cut, we have a hedge-parer's full equipment. Where the hedges are square topped, the tops should be trimmed first, and all the litter cleared off with the forked stick; then the sides, striking downward from the top, and clearing about a two-feet width down to the foot of the hedge; clear out the foot with the point of the hook, and roll back the litter with the hook and stick before proceeding with another width. If, however, the hedge is high, and it has been necessary to use the long handle to the hook, then leave the foot clearing to be done by the short-handled hook after the sides have been trimmed down. As neatness and uniformity are the qualities desired in a newly-trimmed quick-set hedge, a "straight" and "level" eye is required by the workman, who has his judgment alone to guide him in determining how much to cut off from the hedge.

Neatly-trimmed hedges are a most desirable feature in all well-kept gardens, and we can well

imagine the indignation of Evelyn when he heard that the boorish Czar Peter had ruined his hedges at Sayes Court by driving wheelbarrows through them. Well-kept hedges are equally in place as boundaries to farms and fields, and a little money spent in their care is well repaid in additional available ground for crops and grass. We have known a handy man keep the hedges of a field in proper condition for the sole privilege of having the ground at the foot of the hedges as potato ground, and on this alone grew enough for his family.

In a recent journey through Dorset, Wilts, and Somersetshire, I noticed acres of land near the boundaries of fields wasted by encroachments of the hedges, which were at least from twelve to fifteen feet wide, and in a most slovenly condition. If quick-set hedges are neglected, they soon run to ruin, and encroach on the field by sending up suckers from their roots. Those suckers should be grubbed up and planted in the gaps caused by dead wood, and thus the hedge made good again. It is a bad and slovenly way to mend such gaps by merely thrusting in the parings of the hedge, or some bushes, or driving in stakes, and wreathing bushes between the stakes. A good grubbing tool in use by Cornishmen, and named by them a "fizgey," is shown at Fig. 6. It is a strong and heavy tool, formed, as shown, of a broad blade similar to a shipwright's adze on one side, and a stout axe on the other. The eye of the tool is made strong, and it is fixed to a shaft like that of a pickaxe. The adze-like part can be driven beneath the surface of the soil to cut off suckers, and the axe-like part used to cut stout roots. All grubbing of hedges, and repairing breaches by planting, must be done in the winter when the hedges are stripped of all their leaves, and before they show bud in the spring. In making a new quick-set hedge, a trench from 18 inches to 2 feet deep and 2 feet wide, should be dug, and the soil well pulverised. In this the young plants are to be set to two lines in single file about 3 inches apart; as the trench is being dug, the loose soil being thrown around the roots of each plant, and well trodden down around the stem. A rail or wire fence is desirable as a protection to the young plants until the hedge has thickened by growth.



HEDGER'S TOOLS AND APPLIANCES: FIG. 1.—SHEARS FOR CLIPPING HEDGES. FIG. 2.—GUARD. FIG. 3.—PARING HOOK. FIG. 4.—BILL HOOK. FIG. 5.—SPADE. FIG. 6.—GRUBBING AXE OR CORNISH "FIZGEY." FIG. 7.—HATCHET. FIG. 8.—SHOVEL. FIG. 9.—CROOK OR STAKE. FIG. 10.—FAGGOT BAND OF TWISTED HAZEL AS TAKEN OFF FROM WOOD FAGGOT, SHOWING HOW TO FORM THE LOOPS.

In Devon and Cornwall most substantial hedges have been raised as boundaries to fields and gardens, and as a protection to the cattle from wintry winds. Those hedges consist of banks of earth and stones to the height of 6 feet, and of an average width of

3 feet, at the top of which is planted a row of bushes. Where soil alone is used to form the bank, the land through which the fence is to pass being grass or pasture land, the mode of construction is as follows: The site of the fence is first surveyed, the width and direction lined out with wooden pegs on each side, and thick sods of turf, one spade's breadth square are cut from two lines marked out some 6 feet apart; those sods are placed side by side with their grassy sides outward along on the space enclosed by the two lines from which the sods have been cut, and thus form the lines of foundation for the new hedge. The foundation sods having been consolidated with some light blows from the flat part of the spade, another row of sods are cut from the enclosed space each side, and laid closely together on the foundation row, 1 inch inside the outer edge, the intervening space between the two lines of foundation being filled up with soil, or with rubble, or gravel, until after the third row of turf has been cut and laid. This second row is again rendered firm, and another row is cut and laid upon it, also 1 inch further in, and thus the work proceeds by building up a shell of turf with the grassy sides outward, and filling the shell with soil or with rubble, until the third row has been laid, then the rows are carried up straight. If the soil thrown in for filling is damp, it must be trodden in firm between the two rows of sods, but dry soil must not be trodden down so much as wet soil. Some advantage will also follow from having the sods cut with oblique ends, instead of having them perfectly square, for in this case they can be more closely jointed, the joints must also be lapped, as shown in Fig. 11.

It will be understood that the form of the sides must be bevelled, and the soil put in for filling the middle of the hedge must not be rammed or trodden down too firmly. If the sides are carried up perpendicularly or "plumb," they will bulge outward as the hedge settles, and will crumble into a ruinous bank if the filling has been trodden down too much, or when the frosts of winter causes the soil to swell. If on the other hand the sides are carried up taper, cattle will walk up the sides and clamber over easily. The proper form for turf hedges, and also for stone hedges, is that shown by our diagram, Fig. 11. When the bank or hedge has been raised to the height of $5\frac{1}{2}$ feet, it must be planted with a row of young plants, as in planting a quick-set edge, but here any young forest trees may be introduced, considerations of situation, and probability of their growth being calculated. On exposed high ground, the stunted blackthorn, bearing the small fruit known as the sloe, will serve for a good top fence with brambles (this should be planted in November); dwarf oak, and dwarf beech will also grow in such situations; furze or gorse is not to be recommended because it rots the turf.

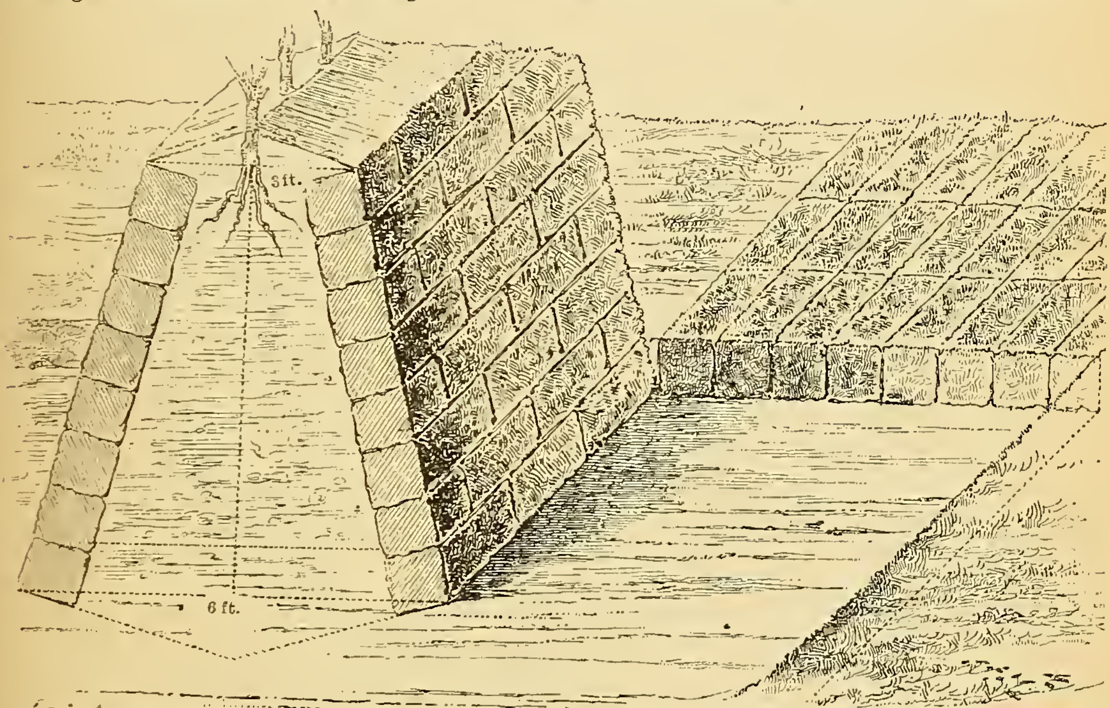


FIG. 11.—SECTIONAL ELEVATION OF TURF HEDGE, SHOWING HOW TO JOINT THE TURFS, BUILD AND FILL THE HEDGE AND PLANT IT, AND ALSO HOW TO MARK OUT AND CUT THE TURFS.

In more sheltered situations, hazel, oak, whitethorn, or hawthorn, ash, sycamore, birch, holly, dogwood, crab-apple, bullace, barberry, privet, and elder will thrive. Any of these may be planted in the spring. Damp hedges in valleys near watercourses will grow withy, hazel, elder, sycamore, blackthorn, and succulent woods. When the plants have been set, put up a finishing row of turf, and heap soil around the stems of the plants.

In planting a hedge, some regard must be had to its future as a profitable wood-bearer, as well as its use as a fence. Hazel, withy, and some growths of oak are available for "thatching-spars," or spears. Hazel, oak, ash, birch, and privet will come in useful for making wreathed hurdles. Whitethorn, blackthorn, bullace, and barberry will be useful as temporary stop-gaps, or as defences against the inroads of troublesome cattle. Whitethorn, and the longer branches of blackthorn, can be used as hurdle brushes for pastures. Ash and sycamore should only be planted in hedges separating pasture, or in the corners of fields; the plants grow rapidly, and provide an excellent shade and shelter for cattle, but crops grow badly in their vicinity. Sycamore will grow into poles useful for stack-beds, whilst ash poles are invaluable for rail fences, hurdles, shafts, and handles for tools, and many other purposes. Oak, ash, crab-apple, and thorn trunks make excellent firewood. Hazel, birch, sycamore, dogwood, barberry, thorn-brush, and privet burn quickly when dry, but they are too light, bulky, and flimsy to be recommended for firewood. Holly is not a useful wood to the farmer or gardener, but its Christmas associations give it a place in our list; its long and straight branches furnish whip-handles and walking-sticks, and the stouter trunks formerly yielded wood for flails. This, together with elder, bullace, crab-apple, and barberry, should only be planted on garden hedges, or around the farm-yard fences.

Owners and occupiers of land exposed to sea-borne gales often experience a difficulty in preserving a respectable hedge, because the salt spray dwarfs the growth of all ordinary bushes exposed to its baneful influence. In such situations the green feathery branches of the tamarisk will flourish in graceful luxuriance, and form a pretty fence, whilst its network of roots binds the sandy soil of the sea-shore.

Turf hedges, like all things earthy and earthly, are liable to decay, and will require care to keep them from getting into a ruinous condition. Small breaches, made by cattle, or by hunting parties, are usually repaired soon after being made; but sometimes this repair is of a most temporary character, being nothing more than a bunch of thorns or brambles thrust into the gap, and secured there by a crook-stick driven into the hedge. Such a rough and ready stop-gap should be soon removed again, and the breach built up properly with turf after all the loose soil has been dug out of the breach and a firm foundation secured. In the western counties, where turf hedges abound, it is the custom to put them into thorough repair once in seven years—in the autumn, before the pastures are broken up for wheat-sowing, and when the turf is in good condition. The method of doing this is as follows: All brambles and brushwood having been pared away from the sides and feet of the hedge, the hedger mounts on top of the hedge, and proceeds to cut off the wood with a bill-hook, Fig. 4, if the wood is small, or the hatchet, Fig. 7, if stout poles are to be cut. The wood is cut down close, leaving only from 2 to 2½ inches of stump, and is thrown off into the fields on each side in regular rows, with the stump ends at the distance of 2 feet from the foot of the hedge, and pointing towards it. If gaps occur in the wooded tops from dead wood or other causes, some stout crooks must be cut, as shown in Fig. 9; a few straight saplings spared on each side of the gap, close to the edges of the hedge, and these saplings must be lowered down into the gap, and secured there, by driving in a few crooks with the hatchet head. Those saplings, when covered and weighted with turf, will send out side shoots, and fill the gap with wood. When the wood has all been cut off, the hedger dismounts, and proceeds to clear out the foot of the hedge with his spade—that is, he slices down the turf against the bottom of the hedge, then cuts a spade's breadth of turf from the foot, and piles this along on the stumps on top of the hedge, then clears up all loose soil, and piles it up around the stumps in such a manner as to make the fence uniform in height, in breadth on top, and with clean-cut sides. All gaps are now made good, and breaches are repaired with turf, as already directed, care being taken to have the line of new turf within the line of the side of the hedge, to well consolidate each layer, and to beat down the filling hard.

When the hedge has been thus made up, we proceed to faggot the wood, and to cut out useful parts of it. Hazel, oak, and withy sticks, of from ½ inch to 1½ inches in diameter, clear, or nearly clear, of side shoots for a length of from 2½ feet to 3 feet, and over, should be cut out for "thatching-spars" or spears, and tied in bundles. Bushy hazel, birch, and oak should also be cut out for pea-sticks, and tied in bundles. Small ash and sycamore rods may be selected for bean-sticks, larger ones for hop-poles, and still larger ones for fence rails, hurdles, etc. The remainder must be made up into faggots, and tied with twisted hazel, oak, or withy bands, Fig. 10. The sticks for those bands should be at least from 5 feet to 6 feet long, and not more than ¾ inch in diameter at the stump end. Cut off nearly all spray, leaving a few at the small end; grasp this

firmly in both hands, twist it, and form a loop or eye, then twist all the remaining part of the stick down to within 9 inches of the stump end. This being done, lay it on the ground with the loop inwards, and proceed to pile up a heap of short spray across the middle of the band, cut this spray into a shapely form with the bill-hook as it is being laid, put the longest wood and the stoutest sticks into the middle of the faggot, then build up some more short spray around, and when the pile has reached to the height of the knees, and appears to be about 2 feet in diameter when pressed down, reach across it to the stump end of the band, grasp it with the right hand, grasp the loop with the left, and pass the stump through it; then grasp this with both hands, place the right foot on the loop, and draw the band tight. This being done, give the band a dexterous twist, whilst it is held firmly, and thus form another loop on the stout end of the band, then turn the stump downward, and bury it among the wood of the faggot. Some firmness and dexterity will be required, and some practice necessary, before a band can be properly made, and a faggot of wood bound; but patience and perseverance will enable my readers to overcome at last. Faggots thus made are built up into square stacks, thatched with straw, and allowed to dry for firewood.

(*To be continued.*)

A CHEAP AND USEFUL MAGIC LANTERN.

HOW TO CONSTRUCT IT AND USE IT.

By OLIVER BECKERLEGGE.

THERE are but few optical instruments more simple in their construction or more capable of affording instruction and amusement than the magic lantern. Sir David Brewster in his "Natural Magic," credits Kircher, who was born in 1601, with having invented this instrument; but it is only within the last comparatively few years that it has developed into a useful scientific instrument. To go back no farther than the date of his letters (1832) it was but a toy. During the last thirty years it has marvellously developed. I have no doubt that many of my readers have witnessed many surprising and beautiful experiments in the old Polytechnic.

Not many instruments have such a range of price, for they may be purchased for less than a shilling up to one hundred pounds. A good serviceable instrument for private use or lecture-room purpose may be procured for something under five pounds. Our object, however, is to give such plain instruction as shall enable any one gifted with good use of eye and hand to make a really serviceable lantern for about a sovereign. Of course, it will not equal in appearance a well-finished instrument made by a regular maker, but with care, it may be made quite as effective. Outward appearance is often not the standard of worth.

The three essentials to a lantern, are, body, lenses, and light. We will begin with the body.

A good useful body can be made out of a biscuit tin, but I think there is but little, if any, advantage, in adopting that plan; of course, it sounds cheap, but then the cost of the material at most is but a few pence, whilst a suitable tin will cost about a shilling; then it is easier to work on a separate sheet than on the box; and, lastly, any one who has the skill to do all the other work would be able to make the body, and, indeed, would prefer to do so. But try the box if you choose, my directions will suit either. The best lanterns are made of mahogany, lined with tin. Any-one clever at wood-work will find it repay him in appearance to make it of that material.

A full-sized lantern is of the following dimensions: —Inside measurement, height (exclusive of chimney) 13 inches; depth, front to back, 8½ inches; width, 6½ inches. As all our measurements in future will depend somewhat on the size of lenses to be used, we will fix on these at once. Taking both cost and usefulness into consideration, I think 3½ inch condensers will be the best; of course, it will be understood that 4 inch will be much better, but then the cost will be proportionately more. A set with 3½ inch condensers, 6 inch focus, and object lenses 2 inch, and 6 inch focus, will cost about 12s. 6d.; ditto, 4 inch, 17s. 6d.; whilst a set with 3 inch can be bought for 8s. 6d. The maker must decide on the size, and work accordingly. At the proper time I will speak of choosing lenses.

In the body we shall require three principal openings. At the back, cut an opening 5 inches wide, about 10 inches high, this is for door; the door must be 6 inches wide and 10½ inches high, so as to overlap the opening and prevent light from escaping. It should have a wire around the edge to make it stiff. At one of the sides, cut away an inch of tin plate where it folds over the wire, 2 inches from top, the same 2 inches from bottom. Now take two strips of tin plate 1 inch wide, 3 inches long, pass one through each opening, bend double neatly, and you will have a substantial hinge for the door. Perhaps the sketch in Fig. 1 will make this clear. Put door in its place, punch two holes through the wing of hinge and back of lantern, and fasten with small copper rivet, as solder would be likely to melt; it can be kept close by a simple button. Having made the door ready for fixing, we will lay it on one side, as we shall be able to work better with it off.

We will now fit the chimney. If the top of lantern is simply soldered on, there will be some danger of it

melting with the great heat, it will be much safer to have it riveted, though for portability it would be better to have it quite loose. In this case, make it like an ordinary tin box lid, with a rim all round, about one inch deep, it then could be easily taken off. Find centre of top, and mark out a square of 4 inches, inside this mark out another square of 2 inches and cut it out; you now have a hole 2 inches square. Cut from each corner to the corner of the larger square. Now carefully bend each side at right angle with the top, we now have a flange to which we can fasten base of chimney. Take a strip of stout tin plate, 2 inches wide by 17 inches long, bend it into a square collar to fit over the flange, there will be a little left to lap over at the end, solder it. See that each side is of the same length, and that it fits the flange tightly. Punch a hole on each side, through collar and flange, and rivet with small copper rivet.

We will now proceed to make the chimney. Take a sheet of tin plate, 15 inches by 17 inches, bend it into a square tube, 15 inches by a little over 4 inches—indeed, just large enough to fit tightly on the collar we have just finished. On the top we must have an appliance for preventing the light escaping, at the same time admitting good ventilation. Take a piece of plate 13 inches by 7 inches, bend each end with a slight curve, so as to stand at right angles with the middle portion, rivet each end to the opposite sides of the top of chimney, so as to form a canopy, the canopy being about 2 inches above the top of chimney. It will be seen now that the ends of canopy are wider than the chimney; equal portions should be cut off each side of the ends with a nice curve. This should be done before riveting. Perhaps some would prefer a round chimney, a similar plan can be followed as to making flange, etc. I think the average amateur will find the square form much easier, and is one adopted by good makers.

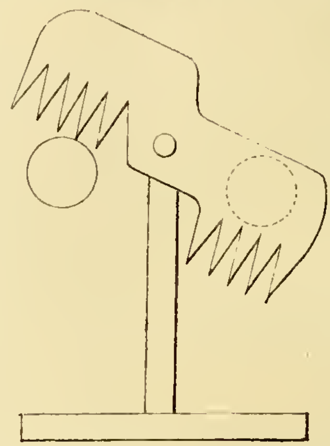


FIG. 7. DISSOLVER FOR MAGIC LANTERN.

We now proceed to the front. Make a centre punch mark $4\frac{1}{2}$ inches from bottom, and in centre of width, with a compass strike a circle from the punch mark, $3\frac{1}{2}$ inches in diameter. This had better be done with a chisel, which will not be difficult to accomplish if the lantern is passed over a block of wood, through the back, with the front resting dead on it. When this is accomplished to our satisfaction, we will proceed to the ventilation.

At the bottom of the two sides we must make a row of $\frac{1}{2}$ inch holes. About six will be sufficient each side, their centre $\frac{1}{2}$ inch from bottom. Take a sheet $7\frac{1}{2}$ inches by $8\frac{1}{2}$ inches, turn up a flange $\frac{1}{2}$ inch wide on each of the longer sides. This is for a false bottom, and will be of the same dimensions as the inside of lantern, viz., $6\frac{1}{2}$ inches wide by $8\frac{1}{2}$ inches deep. About 1 inch from each side punch a number of holes, say six or eight, $\frac{1}{2}$ inch diameter. From the middle cut out a piece 4 inches wide and 6 inches long. Take two strips, 6 inches by 1 inch, place them on the false bottom, with one edge even with the opening cut in it. The other edge must be soldered to the false bottom. We find now the free edge forms a groove in which a stage can slide, for the purpose of carrying lamp and reflector. At one end of the sliding stage is soldered a wire, which comes out at back, and which enables the operator to move the lamp without opening the door. It must be understood that the door does not come down below the false bottom. See illustration of false bottom in Fig. 2.

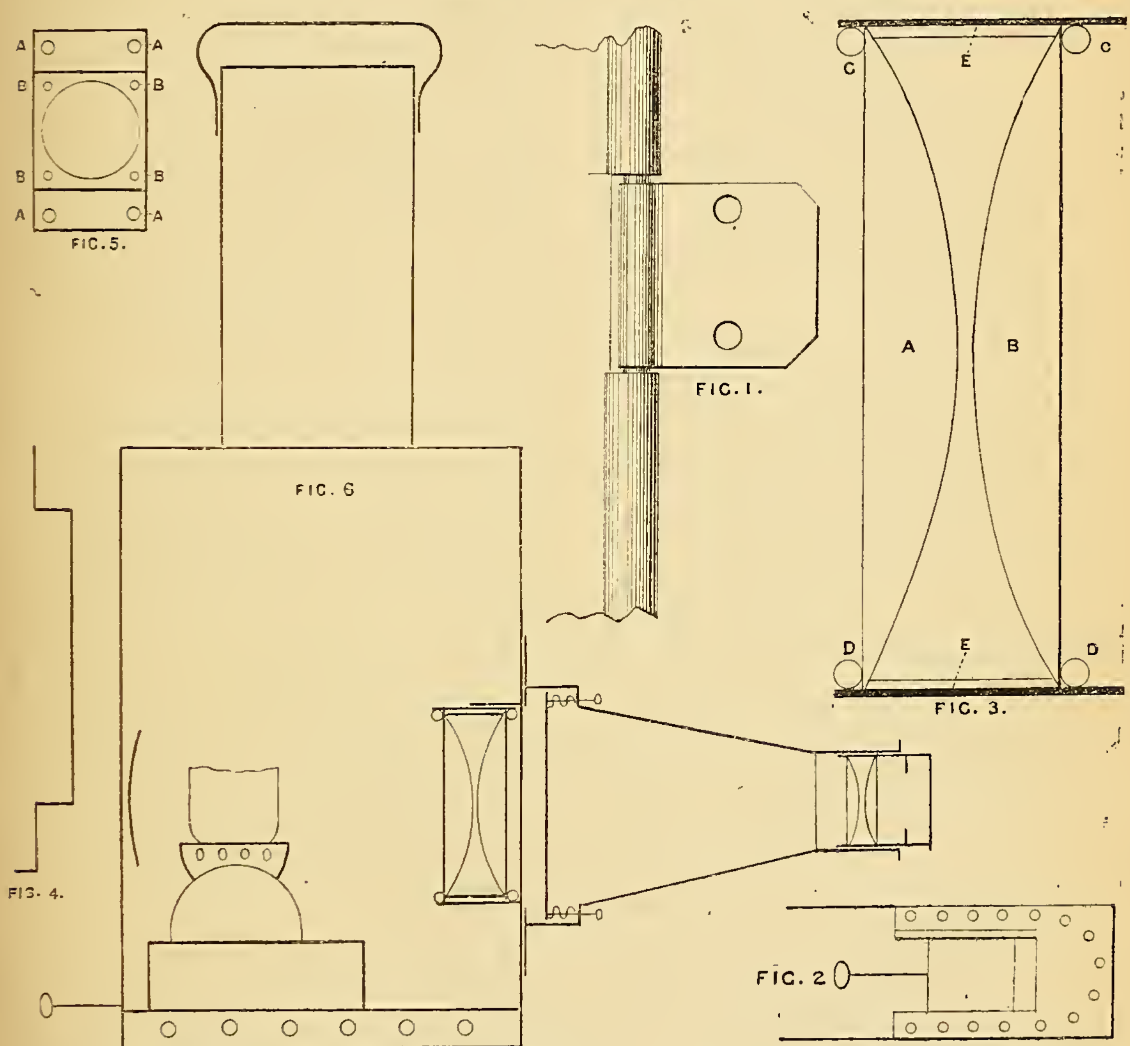
Having made the false bottom, we must now fix it in its place, an inch above the first bottom. We take for granted that it has been so made that it is neither too large nor too small. Take a piece of wood an inch thick, place it on bottom of lantern, place false bottom on the wood. See that it stands even and flat. Now in a place or two tack it to the sides with a little solder. Punch three holes each side and rivet. There will be no danger now of solder melting and lamp upsetting. We now want a ring $3\frac{3}{4}$ inches diameter, and 1 inch broad, with a slight flange on one edge. I do not think the amateur can do this for himself without special tools, but any tin-plate worker would make such a collar for a few pence. It is necessary that this collar shall stand with its sides perfectly perpendicular when the flange is laid on a flat surface. The reason of our being so particular is that it is to carry the cell with the condensers, and it is of great importance that they shall stand true.

See that this collar is perfectly circular. The surest way would be to get a piece of wood turned to the diameter to fit it, and place it on it. Now lay it—with the flange down on the inside of the front—on the circular opening, which has been already cut, and solder it around by the flange. The flange need not be more than $\frac{1}{8}$ inch. If neatly done, we shall see, when looking through the collar, that the opening of front being $\frac{1}{4}$ inch smaller than tube, there is a ledge or flange which will prevent the condenser cell from passing too far through.

We will now proceed with condenser cell. Al-

though we speak of the condensers as being $3\frac{1}{2}$ inches diameter, there may be a slight difference. This being understood, we must really make the cell to fit the lense, and collar we have just described to fit the cell. In actual work it will be better to make the cell first, and then make the collar to fit. Having ascertained the exact diameter of the lens, make a ring large enough to receive the lenses without wedging, and yet not large enough to give much shake. The ring must be $\frac{1}{2}$ inch wider than the combined thickness of the lenses—that is to say, supposing each lens is $1\frac{1}{2}$ in. thick in centre, then the cell must be $3\frac{1}{2}$ in. wide.

It would save some time and trouble to procure this length of brass tubing from an optician, and have the ends turned true in a lathe. Procure if possible a piece of wood turned to fit nicely into the cell, and the end squared off. Put this in the cell, allowing the cell to project $\frac{1}{8}$ inch. Now make a ring of brass wire about $\frac{1}{8}$ inch diameter. Lay it on the end of wood core, and flush with the end of the cell. Neatly solder it in. It will now form a shoulder on the inside, on which one of the lenses can rest. Place one of the condensers in the cell, with the flat side resting on the shoulder. Now cut a strip of stout cardboard about 10 inches by 3 inches. Make it into a ring, and put it in cell, resting on the lens. Carefully place the other condenser in the cell, with the convex side towards the convex of the first, and resting its edge



A CHEAP AND USEFUL MAGIC LANTERN.—FIG. 1.—HINGE OF DOOR. FIG. 2.—PLAN OF FALSE BOTTOM. FIG. 3.—SECTION OF LENSES AND CONDENSER CELL. FIG. 4.—ARRANGEMENT FOR HOLDING SLIDES, CONE, AND OBJECT LENSES, IN SECTION. FIG. 5.—SAME ARRANGEMENT IN PLAN. FIG. 6.—LANTERN COMPLETE, IN SECTION.

on the paper ring. These two lenses should come as close as possible without touching. If the paper ring separates the lenses more than $\frac{1}{8}$ inch, take the lens carefully out, remove the paper ring, and cut off as much as is required to bring the lenses to the requisite distance. Be very careful that the edges of the paper ring are perfectly true, so that neither of the lenses are tilted, but lie perfectly true. When they are nicely fitted in, make a ring of stout brass wire, having first made it perfectly straight, place it in the cell on the second lens. The spring it has will keep it in its place, and prevent the lens shifting. When mounted, it will be as shown in Fig. 3.: A and B being condensers, C C and D D brass rings, to keep lenses in place, and E E, cardboard discs, to keep lenses apart. Our next work will be the cone for holding the slides, and also the object lenses.

Take a sheet of stout tin plate, $8\frac{1}{2}$ inches by $4\frac{1}{2}$ inches. Make centre punch in the exact centre of length. $2\frac{1}{4}$ inches each side of punch mark, scribe a straight line square with the edge. One inch from these scribe another line. Bend the ends at right angle with the centre-piece. Now bend the ends at right angle outward in the second line, which we made. It will now present an appearance like sketch in Fig. 4. Now with compass strike a circle in the front, $3\frac{1}{2}$ inches diameter, and carefully cut a circular hole as before directed. In each corner of the wings punch small hole, as at A, A, in Fig. 5. Four small holes, $\frac{1}{8}$ inch in diameter, must also be made in the four corners of front, as shown at B, B, B, B, in Fig. 5.

We next require a cone $4\frac{1}{2}$ inches long, $3\frac{1}{2}$ inches at large end, $2\frac{1}{4}$ inches small end. To make this cone properly will require some little care, if not skill, as when made it must stand perfectly true with the front. Take a sheet of paper, and with a cord 13 inches long, strike an arc. Bring the pencil $4\frac{1}{2}$ inches near the centre, strike another. Now from the centre draw a straight line cutting the two arcs. From the point where the line cuts the larger circle measure off 11 inches, from this second point draw another line to the centre of circle, pass a knife through these two lines, and through the two arcs, and you have a pattern of the cone. Place this pattern on a sheet of plate, mark size and shape, and cut exactly in the mark, but leaving just $\frac{1}{4}$ inch on one side for joint. Now bend it into a cone, be sure that the one edge comes on the line on other edge. Solder neatly and strong. If properly made, and placed on a level surface, a line drawn through its axis would be perpendicular.

Make a tube 2 inches long to fit in smaller end of cone. This must be set perfectly true, and in line with the centre of cone. The best plan would be to procure 2 inches of brass tubing the required size, and turn up ends true, running a tool mark around one end, just $\frac{1}{8}$ inch from the edge. Place tube in the cone, and bring the end of the cone quite on the tool mark, and neatly solder.

If the brass is not forthcoming, then take a strip of stout plate, 2 inches wide, edges quite true and parallel. One-eighth from one edge make a straight line. Solder it together as a ring. Now place it in cone, and solder as in the other case.

We must now proceed to make our focussing tube. It may be either tin-plate or brass, as our fancy or pocket may decide. In any case it must be just large enough to slide easily in the front. It should be 4 inches in length. We must now make a cell exactly like the one for the condensers, but of a size to fit into the focussing tube. In this case, as in the other, we have described for convenience the making of the tube before the cell, to place in it; but here, as there, it must be understood, that the cell is made first to fit the lenses, which must be $\frac{1}{2}$ inch apart, and then the tube made to fit the cell.

Next we must make a stop. This is a circular piece of tin, of a diameter a shade less than that of the focussing tube. Make a central hole about $1\frac{1}{2}$ inch. Solder a rim around it, so as to make it look like a large pill box, with a central hole in the bottom. This is to be pushed in the focussing tube about half-way between the cell and outer end. This is to cut off the marginal rays of light, and so give a more crisp definition.

Having completed our front to our satisfaction, take the condensing cell out of its collar, and turn the lantern on its back. Lay the front on its place with the wings top and bottom. See that the hole in front is exactly over the hole in lantern. Next see that the front is square with the sides of the lantern. Having everything in its place, with a sharp point make a mark where the four holes in the wings are, see Fig. 5, A, A, A, A. Remove the front, and punch four $\frac{1}{8}$ in. holes. Now take four small screw bolts, and screw the front to the body.

We now come to the arrangement for keeping the slide steady in the slide stage. For this we shall require a plate, tin or brass $\frac{1}{4}$ inch narrower than the opening for slide, and $5\frac{1}{2}$ inches long, with a central hole $3\frac{1}{2}$ inches in diameter. Each end must be slightly rounded so as to take off the sharp corners, and also slightly curved each in the same direction; but not more than about an inch from the end. The object of this will be seen presently. Now place it in the slide stage, bring it up to the cone, and let each curved end project equally each side. Pass a sharp point through the holes marked B, B, B, B, in Fig. 5. Now make four holes where marked. Take four pieces of $\frac{1}{8}$ inch brass wire $1\frac{1}{4}$ inch long, solder neatly one in each hole. The wire must be level with the plate on one

side, projecting on the side which is bent up at the ends. With brass bird-cage wire make four spiral springs. The wire can be coiled around a pencil, each an inch long. Put one on each of the four wires. Now take off the front, pass the four pins with spiral springs through the holes marked B, B, B, B, and again screw on front. You will now see that the springs press this plate firmly against the lantern. You will also see the reason why the ends of this piece are bent forward. By this means a wedge-shaped opening is formed, which easily admits a slide frame of any thickness up to about $\frac{7}{8}$ inch, and holds it firmly in its place.

We now have our lantern complete, but we have left the most important matter till the last—that is, the choice of lenses. The principal flaw to guard against is striæ, or veins passing through the glass of a different density, they of necessity will distort the picture. To detect this, hold it against a strong light, and look at some object across the street. If on moving the glass or your head the object seems to move with a jerk, or becomes distorted, decline to keep it, and return it at once. A scratch is not of nearly so much importance, as that simply means the loss of so much light, and a scratch would not represent an appreciable amount of loss.

I have looked over a good number of catalogues for prices, etc., and find in Mr. Lancaster's, *Birmingham*, who advertises in AMATEUR WORK, some specialities of great advantage to amateurs. As an amateur, I know too of his readiness to help anyone. The lenses I quoted in the early part of this article were from his catalogue. He supplies tin fronts with spring for about 5s., tops with chimney for 3s. 6d., sliding front, with 2 inch lenses, at 5s., rack-work for same for 7s. 6d. Of course, these matters mean the saving of much trouble to anyone disposed to purchase in preference to tinkering. I make these remarks, as I know what a boon it is for the inexperienced to know where they may get just what they want, and at a fair price.

We are now complete with the exception of lamp and reflector. But I certainly would not recommend an amateur to attempt making these. Lancaster advertises one with chimney, and best reflector, for 10s., and a treble refulgent patent lamp at 16s. 6d.

Now for the first exhibition. Trim the lamp, do not turn it up too high to begin with, else before the oil begins to flow freely, the wick will become charred, and so a good light cannot be obtained. Take out lenses carefully, and wipe with a soft silk handkerchief and replace. Arrange lamp so that the flame shall be about centre of condenser. Turn the lantern towards a white wall or sheet, say 10 feet away. At first there will be just a hazy circle of light. Now draw out or push in, as it may be, the focussing tube, until the circle is crisp at the edge. If there is a dark spot in centre or elsewhere, remove lamp from one side to the other, placing it nearer or farther from condenser until the light is even all over. Now take a slide, turning it upside down, pass it between the spring clip and front of lantern, and, lo ! we have made our first exhibit. We may, however, find that a little more focussing is required to make the picture sharp and clear. The disc ought to be good up to 10 or 12 feet. Of course, the farther from the screen, the larger the picture, with a corresponding loss of intensity. In Fig. 6 is a diagram of the lantern complete.

When the lantern is completed, the body and tubes must be blackened. Mix gas-black with turps and just enough gold size to make it adhesive. If anyone will strictly follow these directions, he will have a good lantern for about 20s. This lantern can be used with the lime-light. The apparatus for this is, however, not such as an amateur could easily make.

A pair of these lanterns will constitute a dissolving view apparatus. In this case it is necessary to see hat the lenses for each lantern are matched. Place the lanterns on the same level, inclining the fronts slightly towards each other, so that the two discs of light coincide. In front of the lanterns, and on a level with the object glasses, a comb-like piece of tin must be placed, so fixed as to revolve on its centre. When turned down obliquely, it will hide the light of one lantern, whatever object is in the other lantern will be exhibited. Whilst the one lantern is darkened, introduce a slide. It may be another scene of the same subject as is on the sheet exhibited : for instance, the one on the sheet may be winter, with a watermill frozen ; in the lantern that is darkened, introduce the same subject, but a summer scene, with the watermill revolving. Now gradually and steadily turn the dissolver so that the comb shall cover over the first picture, at the same time the light will begin to pass through the teeth of the second until the first picture is obliterated, and the second is in full view. With a lime-light the effect is produced by turning off and on the lights. Fig. 7 shows the dissolver described.

PRACTICAL LESSONS IN WOOD-CARVING.

By E. ARTHUR EDWARDS.

I.—INTRODUCTORY—TOOLS—BENCH—CARVING BOARD —STROP—SHARPENING TOOLS—POSITION OF CARVER.

IN a series of articles upon the above subject, written more especially for novices in the art, I propose to treat very minutely the various methods to be employed whereby the desired results are to be obtained, giving in the plainest language

directions that I hope can be followed by all who take the trouble to work them out, and illustrating the text whenever necessary by drawings showing all the various stages of the work from the rough wood to the completed design. And I trust that many an embryo Grinling Gibbons, who may have taken up this interesting hobby, and who for want of a little practical assistance, or perhaps perseverance, may have allowed it to drop, may, through the medium of these articles, find that he can yet produce most creditable results.

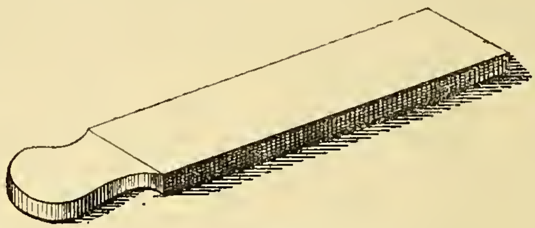


FIG. 3.—BUCKSKIN STROP.

From my own experience, I can say that one of the greatest obstacles a novice has to contend against is the inability to design or even draw properly, for without this knowledge one is quite unable to originate in the slightest degree, and herein will be found the greatest possible bar to ultimate success; but in these days, when schools of art abound and teachers are numerous, there is but little difficulty in obtaining first-class instruction, and I most strongly recommend all who cannot draw, and yet hope to do anything worth the name of carving, to at once endeavour to get at any rate some instruction in this most useful branch of education. It may not seem important at first, when designs are furnished as in this and similar publications, but when left to one's own resources, it will be found to be a *sine quâ non.*

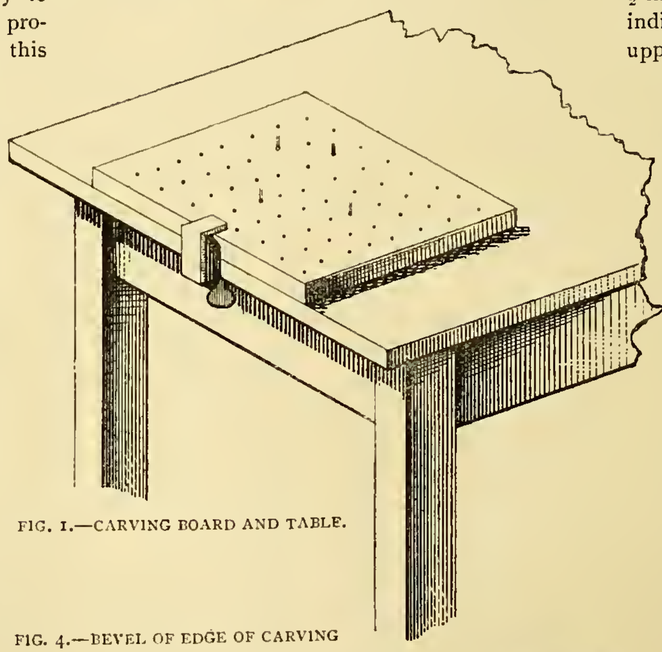


FIG. 1.—CARVING BOARD AND TABLE.

FIG. 4.—BEVEL OF EDGE OF CARVING TOOLS.

In Mr. Parsey's papers on wood-carving a capital bench or table was described (Vol. I., p. 275), on which the wood was to be fixed, and I propose to show how this may be greatly improved, especially with a view to working out those small designs that I think are more within the scope of most amateurs' powers than the massive carpentering work one sometimes sees attempted by beginners. The great desideratum is to obtain absolute steadiness for the work under treatment, as well as facility for changing it quickly and securely into any position they may be required. My own plan is to have a "carving-board" of sycamore, 24 inches by 18 inches by 1 inch, adjustable to any table or bench, pierced through with holes ½ inch diameter, at a distance of 1 in. from one another each way (Fig. 1). Into these holes four or more pegs of pear or other hard wood are tightly fitted, and the work in hand can then be held securely in any conceivable position, leaving both hands free for the manipulation of the tools. A slot ½ inch deep must be cut as indicated to receive the upper arm of a 4-inch clamp, and when this is screwed up even to a dining-table, with a cloth underneath to catch the litter, the amateur may proceed without going to the trouble or expense of having a bench or workshop. Those who are fortunate enough to possess these luxuries will find, that for carving, a few holes drilled in the bench itself would answer the purpose. Mr. Syer, of 1, *Finsbury Street*, supplies carving-boards ready-made in two sizes: 14 in. by 12 in., at 2s. 6d. each, and a superior make, 24 inches by 18 inches, clamped, and very strong, at 9s. 6d. Also, an improved board to be fitted to his bench; prices on application.

We now come to the question of tools; and those who have purchased a stock as advised in p. 276, Vol. I., must pardon me for a few minutes while I dilate upon the advantages of such a set as I have always worked with. I have found about two dozen quite sufficient for every purpose; and to save trouble to inexperienced hands, I have arranged with Mr. Lunt, 297, *Hackney Road, E.*, for the supply of a special "amateur's set,"

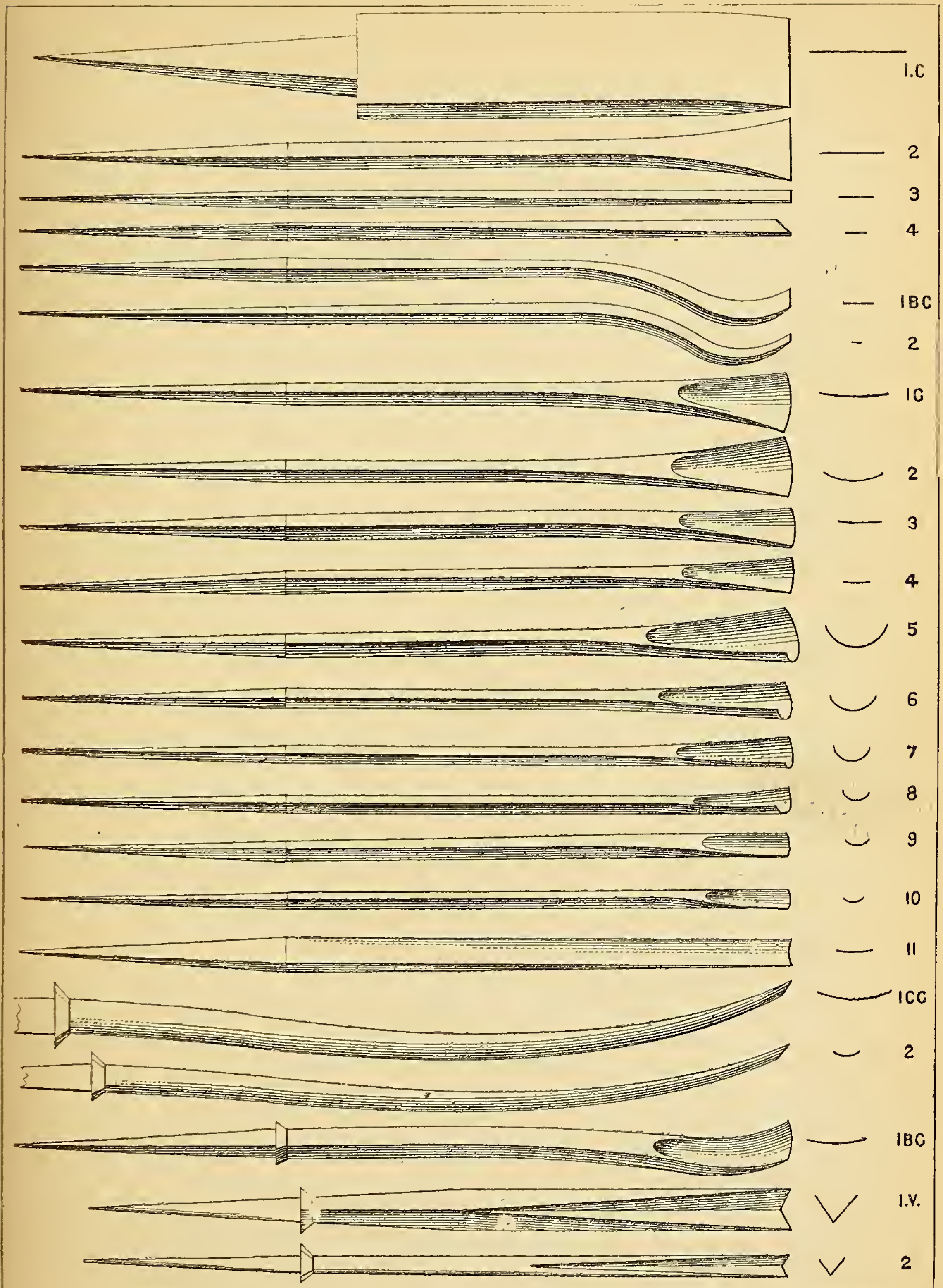


FIG. 2.—CHISELS, GOUGES, AND VEINERS NECESSARY FOR WOOD CARVING.

carefully selected with a view to economy and practical utility. Those who have not yet laid in a stock will, I think, find these of great advantage, as they will be spared the difficult task of discriminating between the merits of scores of varieties, with which their acquaintance may be of the slightest. These tools are warranted, and very cheap at 6d. each, handled. I have given illustrations, in Fig. 2, of a few of these in each class, distinguished as chisels (flat edges), gouges (curved edges), and veiners; and as I shall frequently refer to them, I propose naming them, 1 C, 2 G, etc., etc., so that when we come to the actual work, we may save time by beginning with the proper tool. A grindstone will be found indispensable: a handy sort for amateurs is that fitted in an iron case, size 9½, inches, price 6s. 3d., sold by Goff, 22, *King Street, Covent Garden.* I have fixed a wooden wheel to mine, and work it from the lathe, thereby freeing both hands for holding the tool. An oilstone must also be bought, and three or four hones or slips to fit the curves of the various gouges.

To keep the tools in thorough working order a strop must be made (Fig. 3). It is formed of a piece of buckskin, 12 inches by 3 inches (to be purchased at any tailor's). Get it as smooth as possible, cut in two 6-inch lengths, and with coaguline fix one piece on each side of a flat holder (Fig. 3). When dry, coat one side with a thick paste, composed of tallow and the finest emery powder (1d. worth), and leave the other side plain for finishing. This will be found to give the keenest edge when the tools have been well sharpened on the hone as described hereafter.

A few words on this important question of sharpening will not be out of place, for it is utterly hopeless to expect to obtain decent workmanship with blunt tools. I have often seen work said to be carved, but which appeared rather to have been gnawed by rats, and this most undesirable result is simply due to the fact that the tools only *push* the wood and do not *cut* it. As well might a mechanic endeavour to keep intricate machinery going without paying due attention to the lubricating department, as a carver fancy he will turn out good work when the tools are at fault. Razors have to be stropped before and after using, or the operation of shaving might as well be attempted with a pocket-knife; and sad as it may seem, it is yet impossible to insist too strongly upon this important point, that carving tools to be kept in working order require to be constantly and patiently sharpened and stropped, not only at the commencement of an evening's work, but often at only a few minutes' interval.

As to the method of sharpening—all the tools must be sharpened on both sides, and with chisels this is tolerably plain sailing. The tool should be held firmly in the right hand, and pressed down with the left upon the oilstone, rubbing backwards and forwards several times upon the bevelled edge, and then giving a few final touches to the other edge at a very acute angle with the stone: the use of the strop is sufficiently obvious. With gouges it is a somewhat more difficult operation; the tool should be taken in the right hand exactly as a pen is held, then a slip (oiled)—fitting as nearly as possible to the curve of the gouge—should be held lightly in the left hand, and rubbed up and down the concave edge for a number of times, exactly in a line with the shaft of the tool, and at such an angle that a very fine bevel is obtained. For the convex edge, the hands are held in precisely the same manner, but the edge of the tool should be worked (on the flat side of the slip) round from point to point several times, so that every portion of the surface may be treated equally. The novice must try this operation again and again until his repeated efforts are crowned with success; it is by no means easy to accomplish. Both arms should be pressed against the chest, the right being quite motionless, and the left hand *only* worked from the wrist. The best way to sharpen veiners is to work them on the oilstone, care being taken to rub an equal number of times on either edge alternately, giving a greater amount of pressure at the point than at the top of the V. A piece of soft deal should always be kept handy for trying the tools after sharpening; if they cut it as cleanly against the grain as they would a piece of soap, without leaving any rough edge, all is well; otherwise, a repetition of the process will be necessary. A few hints from a practical hand are often of the greatest value, but when that hand is a carpenter, it must be borne in mind that his tools are not generally ground to such an acute bevel as those required for carving, and in Fig. 4 I have shown the requisite width in ordinary cases. There are several ways of holding and manipulating the tools, and it is very difficult to lay down any hard and fast rules on the subject: the method naturally varies according to the nature of the work in hand. Ordinarily the hands should be placed as in Fig. 5, the handle grasped firmly in the right hand, with the end butted up against the palm to obtain a good pushing power; the two forefingers of the left hand upon the shaft of the tool, so as to control its action and prevent slips. Both hands must at all times be carefully kept behind the cutting edge, so that if a slip should occur the wood alone will bear the injury. I have aid nothing as to the use of the mallet and do recommend it except where the wood has to b_ cut away to any great depth, and as the present range of subjects will only include carving in low relief and in conjunction with fretwork, we shall not require its assistance for the present.

Fig. 5, I should say, will be given in the next chapter. Carvers in the country frequently find difficulty in obtaining a supply of wood to exactly suit their wants, and if a timber merchant is applied to, he will not care to send anything less imposing than a plank of some 10 or 12 feet in length. They will then be doubtless glad to find that Mr. Syer is willing to cut small pieces strictly according to order. Care must be taken to give the exact measurements of the piece required, length, width, and thickness, and it must be remembered that wood in the rough is $\frac{1}{8}$ inch thicker than when planed, and allowance must invariably be made for this when ordering; I have appended a table of prices of woods most suitable for carving. There are two or three ways of transferring the paper pattern to the wood itself; but the one I always practise, and have found answer best, is simply to gum the paper to the wood, and remove it piece by piece. This is more accurate than any copying process, and the fine lines are more easily preserved. It is as well to take one or two copies for future use.

PRICES OF WOOD SUPPLIED BY MR. SYER.

	Per foot super. *s.*	*d.*		Per foot super. *s.*	*d.*
Sycamore	1	2	Walnut, English or Italian . . .	1	1
American birch .	0	10	Walnut, American	1	2
Lime tree	1	2	Wainscot oak . .	1	2
Spanish Mahogany	1	6	ditto, under 6 inches wide .	1	0
Olive wood . . .	3	2			
Pear tree	1	0			

These are one inch thick in all cases; if thinner wood is required, it is rather dearer in proportion for additional sawing.

(*To be continued.*)

HANDY WOOD-WORKING TOOLS, AND HOW TO MAKE THEM.

By ARTHUR J. SCOTT.

I.—THREE USEFUL SURFACE PLANES.

HAVING been a subscriber from the commencement of this magazine, I think I may be excused in saying that I have often thought it would be better for the amateur if he had what may be termed the private tools of the artisan; by which I mean the tools not generally sold in shops, but made by him. I shall try in two or three articles to explain a few handy tools which the amateur will be able to make for himself; and if they prove as useful as they have done to the writer, which no doubt they will, the writer's end will be attained, and you will never regret the time spent on them. The first tools I will describe will be a few useful surface planes. Now, every artisan and amateur knows that in planing end way of the grain in timber, it is very hard to get a clean cut, or a good surface; now, a plane is wanted that will do so. In the three planes that I have given drawings of, there is not one but will leave a nice clean cut and also a good surface on your timber, that is, if kept ordinarily sharp. In these planes, as well as all other tools, the good old motto, "Your tools in good order is one half of the job," stands good for anything you may attempt to make. The iron planes usually sold in the shop will not be of as much service to the amateur as those I shall describe; and, comparing financially, which is not the least point, when the cost of the made plane is compared with that of the bought plane, it is found to be as ninepence is to seven shillings and sixpence, so the amateur gains in every way.

The first plane I shall describe will be the longest one, this is the best for longest surfaces, say about at the extreme eighteen inches. Of course, if it is desired to go over a larger surface even than that, it is generally done by the trying plane. The larger surface plane (Fig. 1) is very handy to use instead of the ordinary smoothing plane—in fact, I almost entirely dispense with the smoothing plane now, as the surface plane will work either way of the grain equally as wel as the other. As to which is the best metal for it, I have all mine made in ordinary metal, but the difficulty in keeping them clean is the greatest trouble. I should say either bell metal or phosphor bronze would be a better substitute, as ordinary brass would be too soft and mark the timber. Now for the making of the pattern. Plane a piece of pine $7\frac{1}{2}$ inches long by $1\frac{3}{4}$ inches broad by $\frac{3}{16}$ inches thick, as D, at Fig. 1; at $2\frac{5}{8}$ inches from one end, cut it out as shown at H. You will get the exact angle for the [iron if you draw it full size on a board. Do not cut it through, but leave it just so that when it is filed up the hole will just peep through; this is sufficient. Next, get two pieces same length as piece D, and $1\frac{13}{16}$ broad by $\frac{1}{8}$ inch full in thickness; leave $\frac{1}{32}$ of an inch of taper in from the base to the top, cut them out to shape of E, and fasten them all together, then fit a piece in C $\frac{1}{4}$ inch thick, leave $\frac{1}{16}$ inch taper in this piece, always putting thickest edge at base, sprig it in, and then make the two hollows, G and I. The object of having a hollow at G may seem strange to some readers, but take advice off an old hand, and sprig one there—it serves as a thumb-piece to press on the timber, which you will find the benefit of in long surfaces. Next make a piece $1\frac{13}{16}$ in. long, same section as F; this is not to be fastened in, or else the pattern would not mould, but must be loosely sprigged, as shown at J in Fig. 2; the pattern now must be sand-papered all over and varnished, the best varnish for this purpose being wood naphtha and

orange shellac. This plane is a . ..provement upon the others I shall describe—firstly, in regard to the thumb-piece, and, secondly, in regard to extension at back. Rosewood makes a good wedge for it; in making the wedge (A) round the corners off so as to fit the hand well. In Fig. 3 we have a very handy plane for all kinds of jobs, big or little; it is equally handy, in fact, for all ordinary small work to be preferred before the first. The process of making is precisely same as the last. You will perceive the piece F is altered in section so as to leave it stronger; this plane looks well with every corner except on the working service rounded. In Fig. 4 you have a plane that is very often used, which, in my idea, is very little more than an oblong box of cast iron, and would not bear comparison with the designs I have put before you in the other diagrams.

FIGS. 1, 2, 3, AND 5 ARE HALF FULL SIZE. LETTERS IN TEXT REFER TO SAME PARTS IN EACH TOOL.

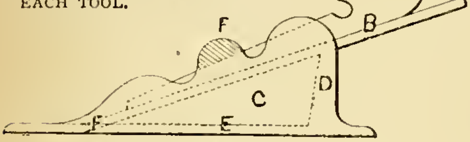


FIG. 5.—THUMB PLANE. Side Elevation.

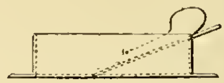


FIG. 4.—OLD STYLE OF PLANE.

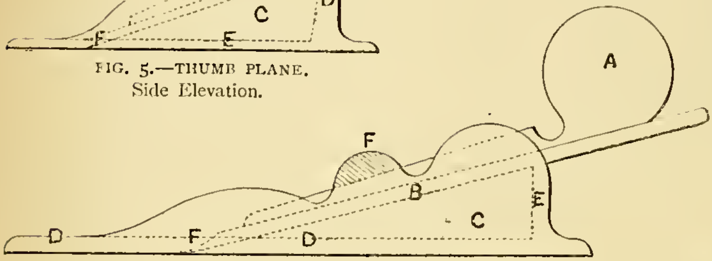


FIG. 3.—SMALLER END SURFACE PLANE.—Side Elevation.

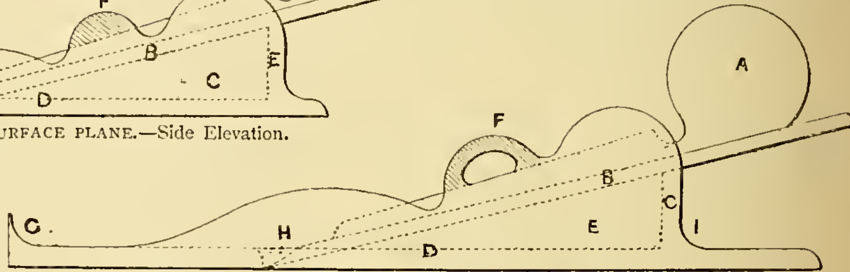


FIG. 1.—LARGER END SURFACE PLANE.—Side Elevation.

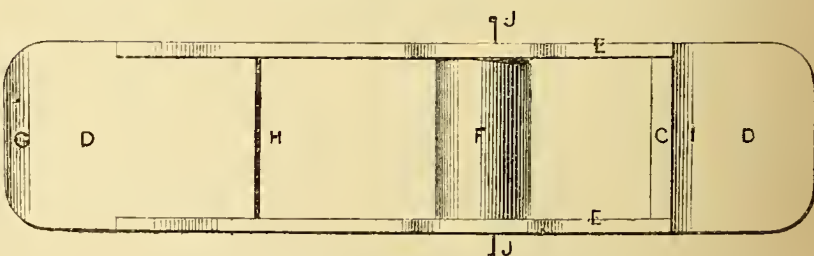


FIG. 2.—LARGER END SURFACE PLANE.—Plan.

This plane was brought into our workshop as an improvement, until I showed the owner of it the planes I have described. The first is entirely my own improvement; and if any of my readers make one like it they will reap a great benefit, and praise it above all their other tools. The smallest plane I would recommend on this principle is Fig. 5. The way of making is the same as recommended for the other planes, only be careful in putting plenty of taper in piece D, and also the sides, as with being less it will be more difficult to draw out of the sand in moulding, leave piece E loose as in the others, but put two sprigs in to keep it in place. To mix the varnish get some of the best orange shellac, also some rectified wood naphtha; just let the naphtha cover the shellac in the bottle, and it will be ready for use in a day's time. Underneath each of these planes you had better sprig a piece, say about $\frac{3}{4}$ in. broad by bare $\frac{1}{8}$ in. thickness, which will keep the castings, especially if made in metal, nice and soft at the mouth, which otherwise, without the pieces, would be very brittle. In fitting do not begrudge an extra half-hour spent on them in getting them up square and true; they will work all the better for it. The best plan is to file and scrape the bottom up true to a surface plate, and afterwards square the hole in the mouth and file the sides square, finishing lastly the edges back and inside. The surfaces of those parts of the iron bed on which the plane-iron fits must be true all over. You can secure this by red leading the back of the iron and filing to it. The good working of the plane will depend on this part of the job being done well; afterwards finish the plane by fitting your wedge in.

I hope I have made these directions plain enough, if not, I will reply to any question that may be asked through the medium of "Amateurs in Council." I am permitted by the Editor, from whom my address may be obtained, to inform the readers of this magazine that I will undertake to make any kind of patterns from drawings sent, at reasonable prices.

(To be continued.)

HOW TO MAKE A BERCEAUNETTE PERAMBULATOR.

By A PRACTICAL CARRIAGE BUILDER.

II.—SPRINGS, AXLES, WHEELS, AND FITTINGS.

HAVING completed the body and carefully observed the instructions given on this subject in Chap. I. (Vol. III., p. 535), the next job is the mounting, *i.e.*, procuring springs, axles, wheels, handles, and fittings for, and the head itself; but before going further, let shut up or welded in the middle when the required length is obtained outside the collars on the arms, and the spindle for front wheel is sent complete, if a set of three wheels is desired; if four wheels (which I should advise in the present subject) are used, of course the front axle is included same as the hind one; but all fully detailed particulars as to size of wheels, lengths of axles, and position, will be given presently.

Now about the wood wheels. No doubt many amateurs will wish to try their hands at wheeling, and as this article would scarcely be complete without, I shall give a full decription of making wood

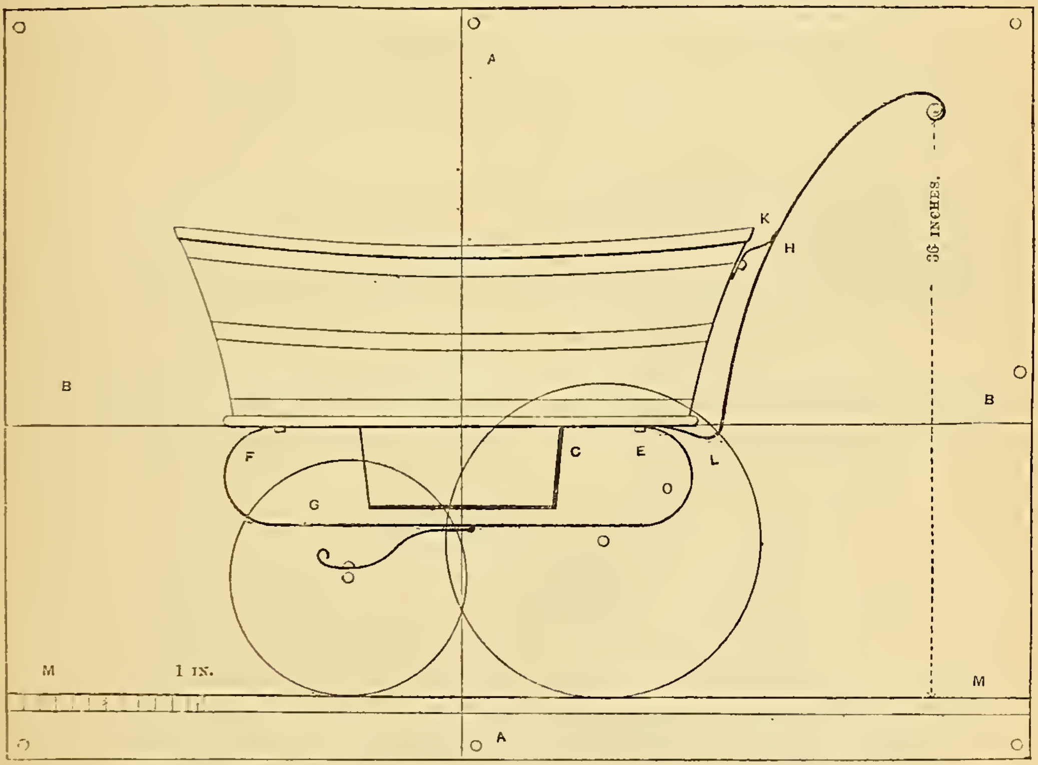


FIG. 10.—DIAGRAM SHOWING METHOD OF MOUNTING PERAMBULATOR. Scale, 1 inch to 1 foot.

me say a few words about the wheels. I strongly advise all amateur perambulator makers to buy the wire or bicycle type of wheels—first, because they are exceedingly strong and durable, if bought of a good firm; secondly, they look so much lighter, and the whole, when finished, have such an elegant appearance, as against wood wheels; that comparison is entirely out of the question, they are certainly more expensive than the wood wheels; and it would scarcely answer any amateur's purpose to attempt making them himself—this could, of course, be accomplished, but they could be bought far cheaper, and when bought the hind axle is sent in two halves, and needs only to be wheels, and leave amateurs to choose between the two for themselves.

Now to proceed with the mounting. Get a large piece or sheet of brown paper, as shown in Fig. 10, sufficient to contain the full size drawing of your perambulator, tack this sheet on to a large board, or just as good, perhaps better, at least less trouble, on to a wall in any spare or other chamber. Keep the bottom edge of this paper about 2 feet from the floor, to prevent the necessity of stooping; be sure the paper is perfectly perpendicular at ends and horizontal at top and bottom edges, now mark a point, say seven inches to the left of the centre of the paper and drop

a plumb line down through this point and draw a line with thin chalk exactly down where the plumb line falls. Most amateurs know that a plumb line is simply a piece of twine or cord with a weight at bottom, which if held at any given point on a perpendicular and allowed to rest, will give a perfectly upright line, and this line is the principal one from which all calculations can and are to be made. Having obtained this upright line A A, as shown in Fig. 10, now draw a cross or horizontal line B B through the last, this cross line represents the bottom of the bottom-sides of the body, upon which the springs are to be secured. To get this line true at right angles, the simplest way is to mark a point say 20 inches up from bottom edge of the paper on the upright line, put a square board up to the point marked, holding its bottom edge accurately along the upright line, and then with a piece of thin chalk draw a line at right angles, then hold a straightedge up to the line just marked, and with the chalk continue this line from end to end of the paper; this is the foundation line upon which the mounting of under parts are all set and fixed. A square board is a piece of board having two of its edges at perfect right angles, the back edge can either be shot (*i.e.*, planed with a trying plane) quite straight, as shown in Fig. 11, or shaped out to any curves to suit the amateur's taste or fancy, as in Fig. 12, which is the common form of this indispensable adjunct to an amateur's set of tools. A straightedge is simply a piece of $\frac{1}{4}$ inch pine or mahogany, made up or planed perfectly parallel, any length to suit taste; but about 3 to 5 feet long and 3 inches wide are very handy and useful sizes.

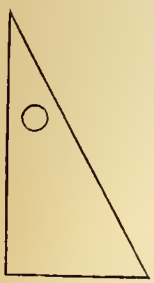


FIG. 11.—SQUARE BOARD.
Scale, 1 in. to 1 ft.

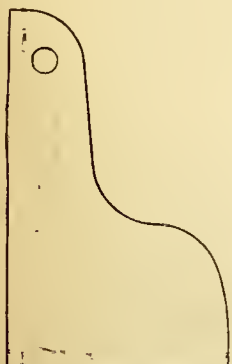


FIG. 12.—ALTERNATIVE FORM OF SQUARE BOARD.
Scale, 1 inch to 1 foot.

Having marked in the lines above mentioned, now draw the whole of the body out upon the cross line, taking care to keep the exact centre of the body itself on the upright line. The amateur may perhaps think too much attention is drawn to these two lines, but as he becomes accustomed to their use this idea will entirely disappear.

Having drawn in the body we now mark in the position of springs and wheels. There are many different kinds of springs, but I shall give here the simplest form, which I am sure any amateur of very ordinary skill will be able to make for himself. To mark in these springs, then, we will decide to keep the axle of the hind wheels 1 inch below and 2 inches behind the well of body, so mark a straight line 6 inches below, and parallel with foundation line, now mark a point 2 inches behind the well on this line, measuring from that part of the well immediately under the body at C, Fig. 10. This will be the exact position of hind axle, and as the wheels will be 20 inches high set a compass to 10 inches, hold one leg of compass $\frac{1}{4}$ inch below the point, and draw circumference of the wheel, now connect the axle line with the body by a suitable curve as at D, Fig. 10. This is the back end of spring; you now mark the front end exactly the same, taking care at each end to allow enough of the spring to extend under the body to allow of fixing thereto with one $\frac{1}{4}$ inch round-headed bolt and one 1 inch No. 12 screw.

Now as the front wheels are very much lower, being only 14 inches high, it will not do to fix the front axle on this spring itself, or the body will be pitched so low in front that no child could keep on the seats, so to meet this contingency another small spring has to be made, to mark in which proceed as below. Measure from the bottom line of body to bottom of hind wheel, where it will touch the ground. Mark a point in front of the body the same depth from bottom line, now with the straightedge draw another parallel line M M on the paper, this is the ground line. Now with compass set to half diameter of front wheel, which will be 7 inches, draw a circle so that will come exactly down on the ground line, but so far backwards that it will project as it were 1 inch inside the rim of hind wheel. The amateur will say at once "This is wrong, how can the wheels turn round like that?" a few words will explain. The front axle is made so much shorter than the hind one that the front wheels revolve freely between the hind ones, thus making the carriage run very much easier and lighter as well as keeping the whole concern as short as possible, compatible with stability, besides making it look neat and snug. Well, from the point where you have struck out the front wheel, draw a line upwards and backwards in form of a return sweep or double curve in opposite directions till it touches the main body spring; of course, the more graceful the sweeps are formed the better the work will look, and as the springs themselves will have to be bent to these lines, it is always best to take some pains, as a chalk line is much easier altered than a piece of steel bar after it is once bent.

Now, as this front spring is to be riveted on to the body spring, sufficient, say $2\frac{1}{2}$ by $4\frac{1}{2}$ in. must be left on for that purpose, and having our lines to work to we will now make up the springs, and the first thing to do

is to get the length of steel required with as little waste as possible ; so, with a piece of common twine, or, better still, a piece of whipcord (as that will not stretch so much as twine), take the length of body spring by holding one end of cord to the body where the spring begins, and follow the line all round to other end, thus, from E to F. Now allow 5 inches on each end for the bolts and screws to fix, and measure the full length, the double of which will be length required for body springs. Obtain the lengths of front spring in like manner, add together, and the result is the exact length of bar required for your springs. Now go to any respectable ironmonger's, and obtain that length of 1 inch No. 11 steel, cut off with a cold chisel (such as is used for cutting metal bars or rods in a cold state) two lengths for the front springs, cut the remainder in the centre of its length, and your steel is cut down ready for spring-making. Mark a centre line in the middle of the two longest pieces, this line to be held up to the centre or plumb line of the drawing during the process of bending the steel. Now make one end of one piece hot, say a bright red, and bend it quickly as possible round to the shape drawn on the paper, taking care to keep the centre marks in their proper places, and when one end is bent to suit taste, proceed exactly with the other ends until the four are complete. After having got one end to shape, the others are easily made to match by trying them edgewise one upon another. The body springs will now be somewhere about the shape of G, Fig. 10. Now take one of the short pieces, and when hot, as before, bend to the form decided in the drawing. Next make the other piece to match, and they are ready for vicing (*i.e.*, filing up), drilling, and tempering. I say drilling, as steel for springs should never, on any account, be punched, the material being very much harder than iron, the metal around the hole is very liable to become cracked in various directions, but principally across the width of the steel bar, which would render it unsafe and entirely unfit for its intended use.

Having marked the position of the hind axle on the body springs, make a dot at the mark exactly in the centre of the width with a centre punch, also mark the two rivet holes in each of the front ends of the body springs where the front springs are to be fixed, also mark the two holes in the front ends of the front springs where they will be fixed to the front axle. All these holes can now be drilled with $\frac{1}{4}$ inch drill bit ; but note this : do not yet drill the rivet holes in the back ends of these front springs, for this reason—it is rather a difficult matter for an amateur to get any vehicle with three or four wheels to run straight and truly where the axles are all fixed ; it is easy enough where the front axle, or a front wheel, is made to revolve around a common centre, such as a phaeton or omnibus, but where the axles are rigidly fixed at both ends, as in most perambulators, some allowance must be made and met to overcome this difficulty, for what can be more vexatious or annoying to find the vehicle, when in motion, to be constantly either glancing off the pavement into the road, or else running at frequent intervals full tilt into the house fronts, etc., along the route, to say nothing of the tiring effect of the constant necessary exertions of the hands and wrists to keep the horrid thing straight ; therefore, to prevent this as much as possible, leave the holes mentioned undrilled until wanted, as I shall endeavour to describe further on. Having drilled the holes advised, now decide where to drill the holes to attach the body springs to bottomsides. In speaking of the shaping of the body springs, I advised that enough should be left on the length cut to fix the spring to the body. Now about 5 inches each end is sufficient, so have a hole drilled and countersunk underneath to take a screw. Countersunk means the hole bevelled all round, so that the screw-head may fit down closely and neatly level with the surface. This hole may be about $\frac{3}{4}$ inch from end of spring, and $\frac{1}{4}$ inch bolt hole, $3\frac{1}{2}$ inches from the centre of screw-hole, but do not countersink any of the bolt holes.

(*To be continued.*)

SMALL PORTABLE FORGE WITH BLAST FAN ATTACHED.

By OLLA PODRIDA.

A REQUEST with reference to the above appeared in Vol. II., p. 352, of AMATEUR WORK, to which a brief reply was given, accompanied by sketches giving front and side elevations of the forge. This reply will be found in Vol. II., p. 547. In the present article I shall adhere to the dimensions given in the reply in question, and also to the general features of the sketch referred to, adding particulars of fan, with sketches showing its construction more clearly.

In the construction of the forge, sheet and angle iron is employed—the sides and bottom of hearth being made of sheet iron, $\frac{1}{16}$ inch and $\frac{1}{8}$ inch thick respectively, and the legs of angle iron, $1\frac{1}{2}$ inches by $1\frac{1}{2}$ inches by $\frac{1}{4}$ inch thick. The dimensions of forge over all are 3 feet in height and 2 feet long, by 18 inches broad. We shall require for legs four lengths of angle iron, each 3 feet long, and of sheet iron the following pieces: For sides, two in number, each 24 by 6 ; for end opposite fire, one in number, 18 by 6 ; for back of fire, one piece, 18 by 15, which may be cut semi-circular, as shown in Fig. 2 ; for bottom. one piece, $\frac{1}{8}$ inch

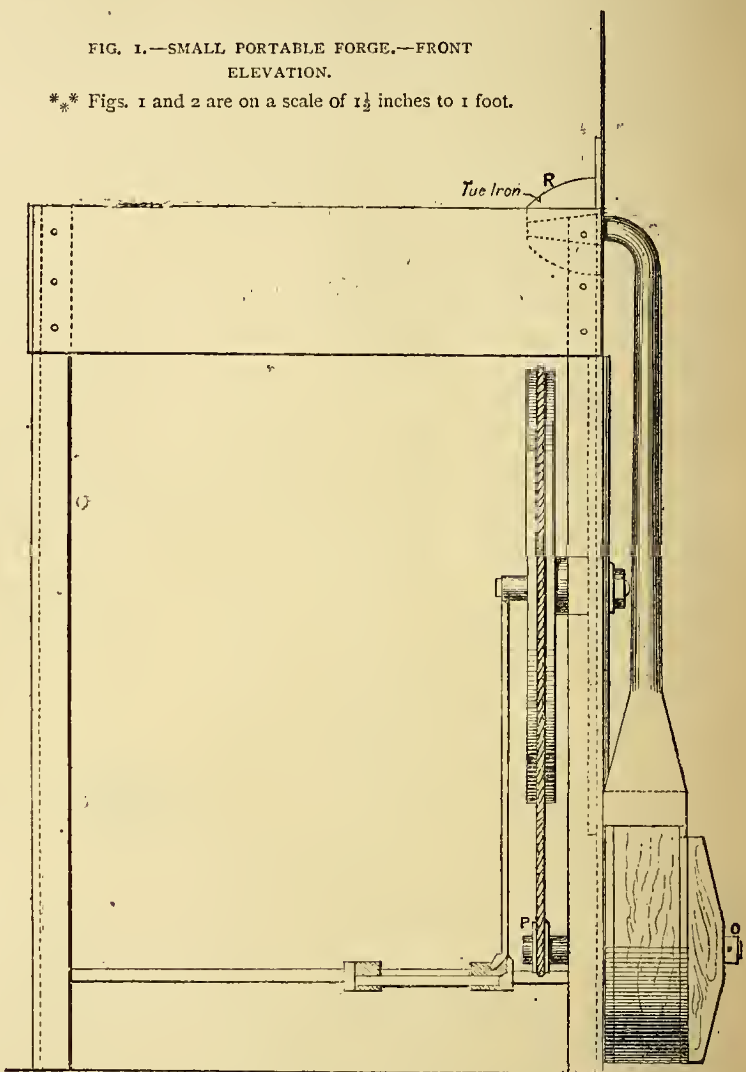
thick, 24 by 18; for support to bolt fan against, one piece $\frac{1}{8}$ inch thick, 18 by 8; also, for cross-pieces supporting fly-wheel, two lengths, each by 27 by $2\frac{1}{2}$ by $\frac{3}{8}$ inch thick; and, for support to pedal, a 24-inch length of $\frac{5}{8}$ inch round bar-iron will be required. The above figures represent inches.

If handy to a boiler-maker's shop, or ship-yard, scrap ends, or "wasters," may be found suitable for the above, and may be obtained at much less cost than new material.

We will take the construction of hearth first. The bottom will be fitted after riveting the sides and ends together. Drill the following holes for $\frac{1}{4}$ inch rivets in angle iron legs: Three for each joint of sides or ends of hearth, spaced one inch from end of angle-iron to centre of first hole, and 2 inches between first and second, second and third; for securing plate for carrying fan, three—same size rivets—at the lower end of legs at back of fire, commencing at $1\frac{1}{2}$ inches from bottom, and spacing 3 inches between. In the same legs the holes for riveting cross-pieces must be drilled—two for each lower end of cross-piece, $\frac{1}{4}$ inch rivets, and one for each upper end, $\frac{3}{8}$ inch rivets. Lastly, to complete drilling in legs, holes for fixing bar to carry pedal must be drilled; one end of this bar is flattened to $\frac{1}{4}$ inch thick, and secured to leg with one $\frac{3}{8}$ inch rivet or bolt; the other end is carried by a small bracket, shown in end view, Fig. 2, at B. This bracket should be bolted, not riveted, to leg, so that the pedal may be put in place; one $\frac{3}{8}$ inch bolt will suffice for this. Get all holes drilled in legs before commencing to rivet, it being much easier to handle them singly. The drilling may be conveniently done in the lathe, or with the crank brace, or "wimble," described by Mr. Lukin in Vol. II., page 549, of AMATEUR WORK.

FIG. 1.—SMALL PORTABLE FORGE.—FRONT ELEVATION.

⁂ Figs. 1 and 2 are on a scale of $1\frac{1}{2}$ inches to 1 foot.



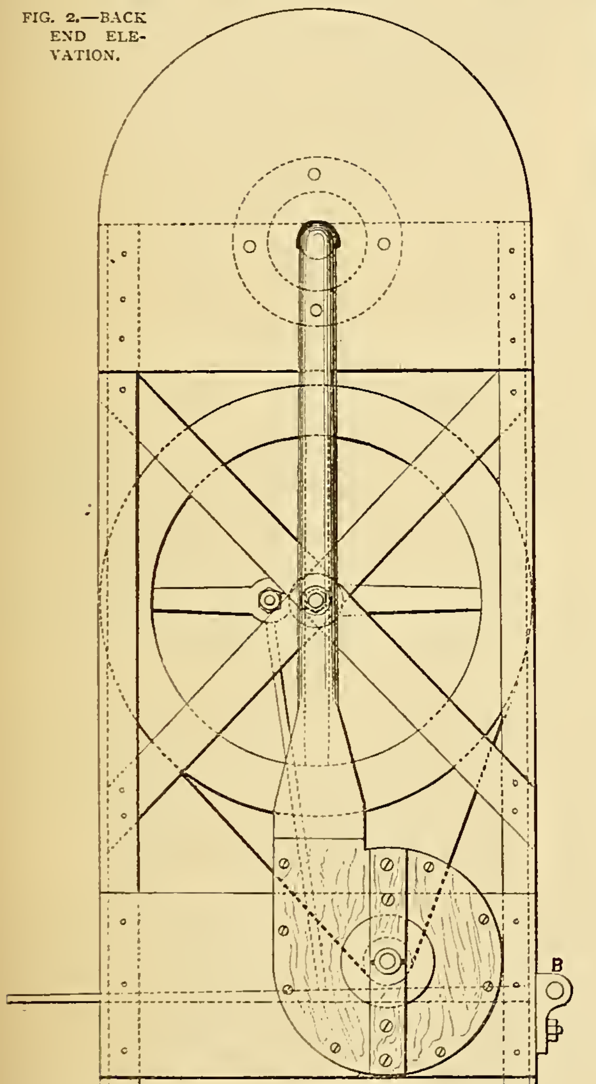
Mark the holes required in sides and ends of hearth from those already drilled in the legs in the following manner: Lay the side to be marked upon the floor, placing the corresponding leg on top. Adjust them carefully, by squaring the upper edge of side, or plate, with each leg, then with a sharp steel point, or "scriber," trace through the holes on plate beneath. A little chalk, or whiting, rubbed on the parts to be marked will facilitate this operation. Having "scribed" the holes, mark the side and legs, so that they may be recognized, and their relation maintained.

The bottom of hearth is riveted to, and carried by L-pieces riveted to sides and ends. The holes should be drilled in sides, and these pieces riveted on before the frame is put together. There are eight of these L's—two in each side and end—and riveted to them by one $\frac{1}{4}$ inch rivet in each. The L, or angle-pieces, are each 2 inches by 2 by 1 inch wide, and $\frac{1}{4}$ inch thick. The holes for securing them are drilled 5 inches from the end of

each plate, and $\frac{5}{8}$ inch from bottom edge, which is kept even with one side of the angle-piece. In centre of semicircular part of plate, forming back to fire, cut a $1\frac{1}{2}$ inch hole for blast-pipe.

Drill all holes carefully to the marks, and clean off all "burrs," or ragged edges from the holes. For $\frac{1}{4}$ inch rivets,

FIG. 2.—BACK END ELEVATION.



the drill should be a "weel grown," $\frac{9}{32}$ inch in diameter, so as to allow for slight inaccuracies in work.

To pave the way for riveting, bolt the parts together with a few $\frac{1}{4}$ inch bolts here and there, so that a general examination into the state of the holes may be made. If the holes are unfair, or do not come opposite each other, split the difference in favour amongst them, screw up tightly, and commence riveting. Holes which are so unfair as to prevent the rivet from entering may be corrected with a small

*** Figs. 3 and 4 are on a Scale of 3 inches to 1 foot.

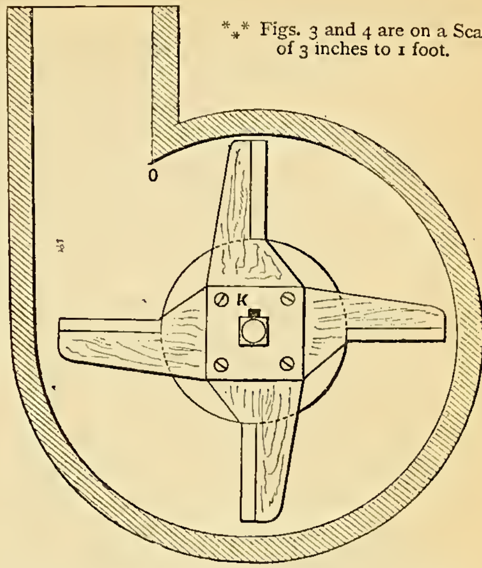


FIG. 3.—BLAST FAN FOR SMALL PORTABLE FORGE—CROSS SECTION.

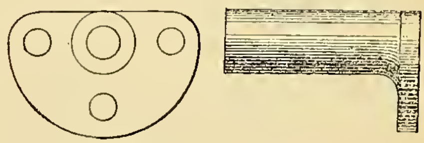


FIG. 5.—BEARING FOR SPINDLE AT E.
Scale half full size or 6 inches to 1 foot.

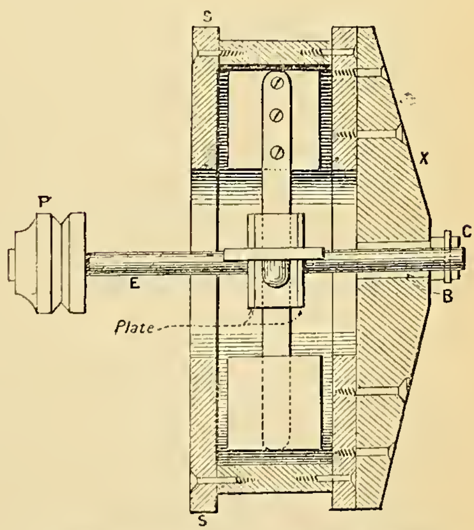


FIG. 4.—SECTION OF BLAST FAN THROUGH SPINDLE.

round file, "reamered," or "drifted." A "reamer," such as would be suitable under the present circumstances, is a square piece of steel, tapering from $\frac{3}{16}$ inch up to $\frac{3}{8}$ inch, filed up, tempered, and ground until the corners are quite sharp ; it is used in the same manner as a tap, being turned by a handle, or wrench, and pressed into the hole by the operator. A "drift" is a round piece of steel, tapering, from $\frac{1}{4}$ inch, from $\frac{3}{16}$ inch to about $\frac{5}{16}$ or $\frac{3}{8}$ inch, forming, in fact, a round wedge, and is driven by smart blows with a hammer. The file, or "reamer," is best, as "drifting" tends to "buckle," or warp the work, especially when the latter is thin and light, as in the present case.

After riveting up the sides, fit the plate forming bottom of hearth, cutting the corners to clear the legs. Mark the holes from L-pieces, drill and rivet in place. The cross-pieces for carrying fly-wheel may now be fitted, marked, drilled, and riveted in place. The $\frac{5}{8}$ inch hole in centre of cross for stud must be marked and drilled on one only, and that riveted in place first, after which the other may be fixed temporarily, and marked from the riveted one for stud, to ensure agreement. These cross-pieces being one inside and the other outside of leg, a space the thickness of angle-iron will occur between them. This space must be filled up by a washer, with a $\frac{5}{8}$ inch hole to suit the stud.

We now come to the fan. This may be made almost entirely of wood. The spindle is of iron $\frac{7}{16}$ inch in diameter at the bearings, and with $\frac{1}{2}$ inch square part in the wake of fan, on which the latter is fastened. The outer end of the spindle is carried by a cross-piece of wood at X, screwed to outside of fan-case, and "bushed" with brass at B, to form a bearing. The inner end on which the grooved pulley, P, is fixed is carried by a brass bearing, Fig. 5, screwed to the plate-carrying fan by means of bolts through the flange, as shown. The case for fan proper is built up of two sides, of the contour given in Fig. 3, $\frac{1}{2}$ inch thick, screwed to the circular part forming the covering. This circular part may be cut out of the solid, or built up in segments, at option or convenience, the curves are struck out from two centres, so that the fan proper is brought into an eccentric position with the outside, and close to the edge of opening at O, giving clearance at the bottom, for the better delivery of the blast.

The fan consists of four arms, made by halving two pieces of wood together, and securing them by iron plates $\frac{1}{8}$ inch thick, screwed to each side on the centre. These plates are provided with square holes fitting tightly on the square part of spindle, and secured by means of a key at K. The diameter of fan across the tips is 8 inches, and the vanes are 2 inches square, screwed firmly to the arms. On the outer end of spindle, at C, a collar is pinned to prevent lateral play, which would endanger the safety of the apparatus. The pulley being fixed close to the bearing on inside acts in conjunction with this collar.

The fan is secured to the plate carrying it by wood screws through the plate from inside into the case. A $\frac{3}{4}$ inch hole must be drilled into the plate to allow the spindle to clear through. The fan should be fixed on the plate, and the bearing in Fig. 5 carefully adjusted until the spindle runs freely. The plate may then be drilled, and carefully riveted, or bolted, in place.

The blast-pipe may be made of stout tin. The nozzle, or mouthpiece, at upper end of pipe, must be curved so as to enter within the tue iron at R. This tue iron, as it is generally called, is a block of cast iron provided with a flange for conveniently attaching it by means of bolts to back of hearth, and has a hole through which the blast is conducted to the fire. Its use is to protect the blast nozzle, and prevent damage to the back of hearth, by enabling the fire to be kept well away from the latter.

A substitute for the cast iron one may be made of a short piece of gas-pipe, $1\frac{1}{4}$ or $1\frac{1}{2}$ inches internal diameter, with a flange screwed on one end for attaching to back plate. This pipe should be covered thickly with fireclay, and the bottom of hearth likewise, in the vicinity of the fire. When properly dried, the clay will afford good protection from the intense heat of the fire. There is no division for holding water shown. It is not required—a bucket at hand will be quite sufficient.

The pedal is made of tough wood—ash, for instance—about 1 or $1\frac{1}{4}$ inches thick, with hinges fitting on bar at back. These hinges may be made of hoop-iron, 1 inch wide, by $\frac{1}{8}$ or $\frac{3}{16}$ inch thick, bent round at one end to form an eye corresponding in size to supporting bar, and about 6 inches long, to allow room for attaching by wood screws to pedal.

The connecting-rod between pedal and crank-pin should be of $\frac{1}{4}$ inch round iron, flattened and turned into an eye at the upper end, fitting on crank-pin, and hooked at the lower for attaching to another hook secured to pedal. To get the length of this rod, turn the wheel round until the crank-pin is at the bottom of the stroke. Then, keeping the end of pedal about 1 inch clear of the floor, measure from hook to crank-pin for length of rod.

The fly-wheel is 18 inches outside diameter, and should weigh about 40 lbs. The throw of the crank-pin should be about 4 inches. The wheel is carried by a stud, which passes through centre of cross-pieces at back of fire, and is secured by a solid collar on the inside, and a $\frac{5}{8}$ inch nut and washer on the outside, the wheel being kept in place by a washer and pin through the stud.

The small grooved pulley on fan-spindle is 2 inches in diameter, and should be made of metal keyed firmly in place. The driving-band, or cord, should be well dried before it is put on, otherwise the heat will cause it to become slack. Should this occur, wetting with water, or oil and powdered resin will prove a remedy.

Care must be taken to ensure that the fan runs free and steady. It should be well balanced, so that no "side," or arm, is heavier than another. This should be carefully checked in a lathe between the centres, and the heavy parts lightened, or a couple of wood screws put into the light "side," as found necessary.

HELP FOR STRUGGLING AMATEURS.

By PITCHPINE.

I.—ON BUYING NEW AND SECOND-HAND TOOLS.

I AM one of you, oh ! my brothers. Like you, I know only too well what pangs of envy are called up by the sight of an illustrated catalogue of tools, with engravings of convertible iron planes that will do anything ; of beautiful little tools that will perform some work which you are now struggling with, in about half the time it takes you to puzzle out how to do it with some makeshift. I know, oh so well, how persistently one is tempted to break the tenth commandment, when, in the elaborately-fitted workshop of some more favoured friend, you gaze with longing eyes on lathe and circular saw, on circular cutters, and all the elaborate machinery that produces work of the highest order, with the minimum of trouble. But I have also learned to know that these tempting luxuries can be dispensed with, and that with your second-hand kit of tools—and not too many of those—you can, with patient perseverance, do work that shall be a greater credit to you than if you possessed all the "latest American novelties," and had a workshop crammed with machinery. You think I say this, because "the grapes are sour." They are not sour : they are distractingly sweet; but when you can't be anything else, be a philosopher, and make a virtue of doing without what you can't have. In this case, at any rate, virtue is its own reward, for you get a command over the tools you have, that will, in a short time, recompense you for any extra trouble you may have had, and be a constant source of pleasure and satisfaction.

I have been through the mill myself, therefore I know how it grinds ; and I hope, by my experience, to help you a little here and there, and smooth down some of the little roughnesses for you if I can. It is over fifteen years since I first had the mania for wood-working come upon me, and since then I have picked up a wrinkle or two.

I propose, in writing this paper, to show how (in the light of my present experience) I should set about getting together a stock of tools and appliances—always bearing in mind that I am writing for those, who, like myself, are suffering from debility of the purse.

If you have ever watched a joiner at work, and are a close observer, it will have occurred to you how few tools he really uses for the work he has in hand. He may have a large stock of tools of all kinds about him, but that is only because his work, being varied, calls in turn for the use of different kinds. Of course, you hope that your work will be varied, but the variations will occur only at comparatively long intervals, and it follows, as a consequence, that even supposing you want a new tool with each new piece of work you take in hand, the requisition on your purse comes only at intervals, leaving a period of rest to recruit its constitution, thus spreading the expense of your outfit over a long period. This, then, gives us the first hint.

Don't try to get a chest of tools, but buy each tool as the necessity for its use arises. Chests of tools are very different now from what they used to be, and contain a much better class of tools ; for those who can afford it, I have nothing whatever to say against them, but, leaving quality out of the question, if you buy a good chest—and it is no use doing otherwise—you purchase a few tools that you will use at once, and a good many that you will not require for, perhaps, years to come. Besides this, a chest of tools intended for real work is expensive, and instead of waiting until you can afford so large an outlay, you may as well be at work with the tools you really require.

Another hint : When you can buy second-hand tools, don't get new ones. The second-hand ones do the work just as well as the new ones, and cost less, and, in addition, their quality is proved. The French polish and glitter of the new tools looks very well in your tool-rack, and has a general "spick-and-span" appearance that is decidedly tempting ; but bear in mind that you can't afford to buy French polish, and so long as you belong to the fraternity whom I am addressing, you must resolutely ignore appearances, and go in for usefulness only.

Now comes the question : What is to be your first purchase ? That, of course, depends upon the nature of your first job ; for, as I showed you just now, you only purchase tools as necessity arises for the use of them. If you will take my advice, your first job is ready for you. It is easy, requires little skill beyond what is necessary to make a straight saw-cut, and

being, when finished, part of your plant, you save money by making it, instead of buying it ready-made. I am, as you will see, presuming that you are making a clean start, and have not as yet acquired any tools at all. This is, I think, rather an extreme case, as there are very few houses that cannot show something in the way of tools, though it may be only a saw and a hammer. I will, however, take the extreme case, and presume that you have none.

Well, my advice is, make a work-bench to begin with. I managed without one for a long time, but it is uphill work, and vexation of spirit, and, if I were starting again, my first job would be to make one. It need not cost you more than about twelve shillings to make a good, strong, serviceable bench, and the money will be well expended. I will show you how to make one for that money, what tools you will require, and what you will have to pay for them. But, before doing so, I have still a few words to say as to the purchase of tools in general.

If you live in London, you will have plenty of opportunities of seeing second-hand tools for sale; although I have picked up some of my greatest bargains in the country. Notably, on one occasion, when on the look-out for a beading-plane, I chanced across a stall in a country market-place, where I purchased, after some little bargaining, for the modest sum of three shillings, three beading-planes, a set of $\frac{3}{4}$ inch match-planes, a toothing-plane, two rounds (without the corresponding hollows), and a moulding-plane, all in working order; average price of each, fourpence! When I had scraped the grease and dirt off, and sand-papered and oiled them, their original owner would not have recognized them, and I would not have taken four times the money for them. I mention this to show you that you can buy tools that will suit your purpose at a very reasonable price if you only go about it in the right way. Pawnbrokers' shops are good hunting-grounds, and it is worth while to keep an eye upon "rag-shops," politely known as marine-store dealers. Find out all the likely places for second-hand tools in your neighbourhood, and make a note of them. When you have decided that you want a particular tool, don't rush off in a hurry and buy a new one. There is plenty of time: your job won't spoil by waiting a bit longer; neither will you lose a customer if you don't get it finished in time. So just take a look round amongst your friends of the second-hand persuasion, and see if they can suit you. As a start, keep a look-out for the following tools, which you will require in making your bench. As it is obvious that the prices of second-hand tools will vary immensely, according to their state of preservation, and will be affected by a number of disturbing causes, I append to each the price at which I can purchase them new. This will be a guide. The price for second-hand tools will vary from one-half to three-quarters the price of new: 28-inch hand-saw (half rip), 6s.; 17-inch jack-plane, 5s. 3d.; 9-inch square, 2s. 6d.; 7-inch screwdriver, 1s. 2d.

As I know my lecture will be but dry reading to a good many, I will only give it in small doses. More shall follow in other chapters. What I have already written will suffice for Dose the First, and I can only hope that the reader will find the announcement of more to come more palatable than the "*Repetitur haustus*" of the doctor.

(*To be continued.*)

THE RENOVATION OF OLD PRINTS, DRAWINGS, AND PAINTINGS.

By JOHN BRION.

(*Continued from Page* 487, *Volume III.*)

IV.—THE CLEANING OF OIL PAINTINGS.

IN my last article I treated of the injuries that arise to the canvas of pictures from damp. To these may be added, in the case of panel—worm, rot, splitting, warping; and, in copper, indentations and oxidation. Each of these maladies will, in their proper places, receive attention.

We frequently hear of, and occasionally see, even in our public galleries, the results of outrages that have been committed upon paintings by so-called "picture-restorers." The greater part of these are not chargeable to rashness or indifference, but have proceeded from ignorance of the chemical and mechanical principles that are involved in the production of oil paintings. I have already spoken concerning the use and abuse of varnish, and it will be necessary hereafter to touch upon its chemical properties; but I will now proceed to examine the pigments employed in works of art.

The resources of the Old Masters were very limited: with only a few ochres, oxides, and a sparse array of simple chemical combinations, the results obtained are amazing, and oft-times baffle all endeavours to discover the secret of the success. Of one thing we are certain—the artists were intimately acquainted with the nature of their materials, and not only "*mixed* their colours with their brains," as recommended by Fuseli, but, being their own manufacturers, they *ground* and manipulated them by the same effectual formula; and we know, also, that an acquaintance with the use of the muller was regarded by the old schools as being as necessary to the artist as that of the pencil. In this

way they acquired a thorough knowledge of the distinguishing properties of colours that readily blend or are antagonistic, fleeting or permanent, adhesive or otherwise. In these days, when manufacturers have all the resources of chemistry and machinery at command, it would be idle to hint at the desirability of artists compounding their own pigments, but I do nevertheless maintain that a complete knowledge of the chemical nature of all colours would oft-times enable the artist to secure greater permanency for his works than we see even in this generation; while a picture-cleaner or restorer without such knowledge must be as dangerous as a blind man using edged weapons in a crowd. These remarks may seem tedious, but they will enable the reader to follow me more clearly in my observations on "Cleaning and Restoring." Now let us imagine that a picture is placed before us, very dingy and discoloured, but in other respects fairly well preserved.

1. Remove the painting from its frame; carefully examine the canvas or panel, to ascertain whether there be any symptoms of decay, bulging, or slacking. If there be none—

2. Fit a piece of thin, smooth deal or mill-board exactly within the wedged frame of the picture, so as to lie close to the canvas back; secure the board with a few tacks. Lay the picture, face upwards, flat upon a table or bench; take especial care to keep the painting in a horizontal position, as any deviation therefrom may cause the cleaning liquids to run down in little streams, and result in much damage to the work.

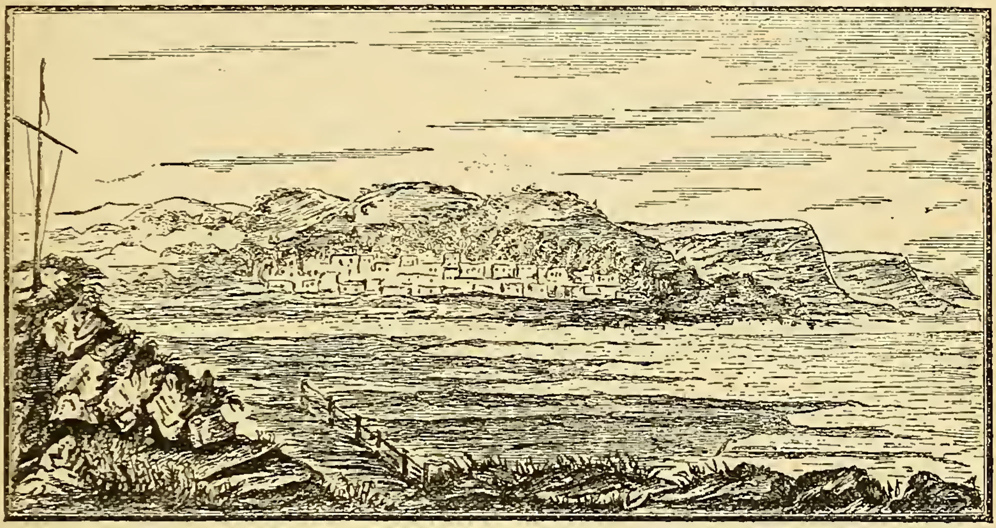


FIG. 7.—VIEW OF EXMOUTH, EXEMPLIFYING MODE OF CLEANING OIL PAINTINGS.

3. Take ox-gall, dilute it with two-thirds of cold water; wash the painting quickly over with the liquid, using a piece of sponge or soft chamois leather well soaked in the gall and squeezed half dry. On no account allow the liquid to remain upon the painting in pools, or for more than a few moments. The more rapid the action of washing, and the more sparingly the gall is applied, the safer will be the operation. All watery liquids are objectionable, as there is a danger, when unskilfully used, of their penetrating through cracks in the varnish to the priming of the canvas, and thus causing great damage, especially to the works of the Old Masters, whose "grounds" are often very absorbent—in fact, little more than size

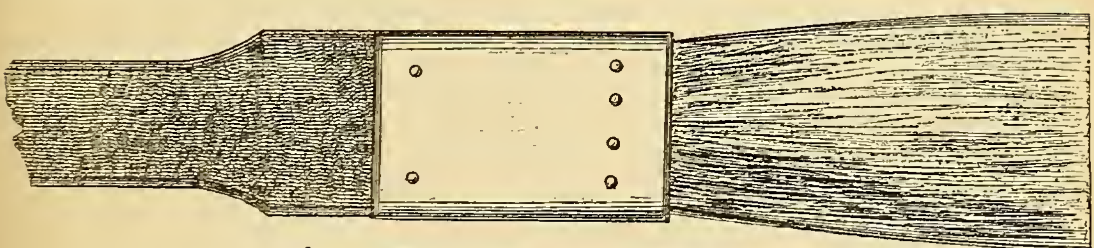


FIG. 8.—FLAT BRUSH SUITABLE FOR VARNISHING OIL PAINTINGS.

and ochre. Many a valuable picture has been in a few minutes irreparably injured by drenching it with water; but with the careful, speedy manipulation we have advised, dirt and grease will be safely and effectually removed, and the picture made ready for the third stage of cleaning.

Note.—The board at the back of the painting is recommended, in order to prevent the work from suffering from the pressure of the various operations. Turpentine may be used instead of diluted oxgall, but will require the same care in its application as that which we have just advised. After cleansing with ox-gall, wash off with clean cold water, still using the like precautions.

4. If the picture has not been sufficiently brightened by the treatment of ox-gall, but is obscured by dark or old varnish, we must proceed to remove it.

Varnishes differ greatly in their nature, some being comparatively soft, others flinty; generally speaking, the older the varnish the more difficult is the task of removal. In order to accomplish this, powerful solvents have to be employed. The chief of these are: Spirits of wine, oil of tartar, ether, naphtha, turpentine, oil of spike lavender, liquor ammoniæ, liquor potassæ, soda, soap, all of them powerful in action, and requiring the greatest care in their application.

Mastic varnishes, and those of a similar nature, especially when not old, may be removed with ease and safety by using spirits of wine, proof strength, mixed with a fourth part of linseed oil, or the same proportion of turpentine, well mingled by shaking. The turpentine reduces the risk of the action of the spirits upon the colours of the picture; the oil enables the progress of the cleaning to be better observed. I have found it advantageous to use them both alternately.

Take two pieces of cotton wool, form them into little balls, so that they can be conveniently held between the thumb and two forefingers. Charge one moderately full with the mixture of spirits of wine and oil, hold this in the right hand, and the other, slightly moistened with turps, in the left. Commence with the light parts of the picture, as the sky and sea in the sketch of Exmouth, Devon, in Fig. 7. Rub gently, with the spirits of wine and oil, *in a circular motion*, upon a small portion of about two or three inches in diameter. In a minute or two examine your woollen ball, and if it be at all discoloured wipe off the portion you have been operating on with your clean woollen rubber and turpentine. If the spot is not properly cleaned, renew the treatment with spirits of wine, taking especial care to have a clean part of the cotton ball every time you resume your work, otherwise you will do little more than soften the varnish, and rub the discoloration into the pigments of the picture. Carefully watch the progress of your work by frequently washing off with the ball of clean wool and turpentine, and if you perceive the slightest tinge of colour, different from that of the discoloured varnish, stop further progress, for you have reached the body of the painting; wash off with turps, and proceed to another spot, working gradually up to the darkest shades. In this manner the whole of the varnish may be safely removed.

Old, hard varnishes, especially copal, will not yield to this treatment. The more powerful solvents as *liquor ammoniæ fortis*, or *liquor potassæ*, must, therefore, be resorted to, but the stronger the solvent the greater the need of watchful care in its use. The manipulation is the same as with spirits of wine. Some picture-cleaners employ delicate steel scrapers to remove the blisters and other protuberances of varnish, but the practice is extremely dangerous. Steady persistence with solvents will accomplish all that can be safely done.

It sometimes happens that a painting which has never been varnished requires cleaning. Solvents must never be used in such a case. Gentle washing with diluted ox-gall, and after that a rapid application of yellow soap and water, quickly dried off, will effect all that is desired.

5. After the varnish is removed, wash the entire surface of the picture with turpentine, brush it over very slightly with linseed oil to bring up the colours; carefully examine every part in order to ascertain whether any portion has been expunged and requires retouching. Avoid repainting unless there be a glaring defect, or you are well acquainted with painting in oil. When all is ready, wipe off the oil. Take mastic varnish, add one-third of spirits of turpentine, mix thoroughly by placing a strong bottle or can in a vessel containing boiling water, shaking well, and occasionally loosening the cork of the bottle. Varnish the painting lightly and quickly over, using a flat brush of hog-hair, Fig. 8, which may be procured of artists' colourmen, of widths varying from one to five inches. Let the first coat of varnish dry thoroughly, add a second as thinly as possible, and in the course of a week or two, if a third be needed, let it be applied, ever remembering that the thinner the varnish the more advantageous it will be for the picture.

Note.—In cleaning figure paintings begin with the flesh tones, working gradually down to the deepest shades. The high lights will usually stand well under the process of cleaning, being generally composed of hard body colours. Greys, greens, and blues require extreme care, for they are frequently the subjects of glazing, with which the varnish assimilates so closely that it requires the nicest skill to separate it. On no account be tempted to hasten the cleaning process by

covering the face of your picture with a solvent, and allowing it to remain to do its work wholesale, or probably the result will be wholesale destruction. Some persons use the fingers instead of wool in applying the solvents ; we do not advise it, as it often produces a misty effect. Should you wish a picture to be cleaned by a professional man, beware of trusting it to unaccredited advertisers, whose specimens of wonder working are often mere delusions, their *modus operandi* being the selecting of a new picture, which they proceed to doctor, leaving a bright portion on one side to represent a cleaned half, while dark varnish, a little smoke, and lampblack perform the dusky transformation of the other half, so well understood by certain disciples of the easel. Consult the artists' colourmen whose names we quoted at the opening of this article, or Mr. C. Breitvart, 343, *Edgware Road, London*, where I have seen the most pleasing examples of skill and thoroughness, and you will be in safe hands.

(*To be continued.*)

DECORATIVE SPOUTING.

By ARTHUR YORKE.

THE wanderer among Andalusian cities is as he passes along the streets, frequently struck by the singular character of the water-spouts which he sees projecting from the parapets of the houses. They have the appearance of so many dragons or winged serpents regarding him in a most threatening manner from on high ; and, should a storm happen to come on, and he be so incautious as to walk in the line of their outfall, he will find the threat implied in their looks by no means an empty one. It seems somewhat anomalous that in so arid a country as the south of Spain water-spouts should be made the subjects of so much care, whilst in our rainy England, where their services are almost daily called into requisition, so little should be done to render them decorative or suggestive ; for, since the grotesque gargoyles of the sixteenth century these things have been almost wholly neglected as ornamental features of our buildings. Profiting by his observations in Spain, the writer has made some attempts in this direction with regard to his own house, and he would be glad to convey whatever benefits he may have gained from his experience to amateurs generally.

The older of the fantastic Spanish spouts are of terra-cotta, covered with a green glaze, and to imitate these would be beyond the scope of the ordinary amateur. The more modern ones are, however, of sheet metal, either painted, or depending for their decorative effect upon their forms alone, according to the fancy of the workman. These latter it is which the writer has himself reproduced, and these it is within the power of every moderately ingenious amateur workman to reproduce likewise.

By referring to Figs. 1 and 6, the reader will gain some idea of the results attained. The spouts there given, which are some of those constructed by the writer, may not, strictly speaking, be ornamental, but they are, at least, "expressed in fancy ;" and if placed in situations where he can watch them from a window on a wet day, their grotesque effect whilst spouting water will not fail to reward the artificer for his trouble. Their forms may, moreover, be improved upon by workers of greater imagination.

The best material from which to make such things is zinc. The worker will need zinc tubing, which costs about 5d. per foot, and sheet zinc, which will not cost more than four or five shillings the square yard. For cutting his material he will require a pair of zinc-shears (shown in Fig. 5), which cost 2s. 3d. His other tools for working it will be the tenon-saw, file, pliers, hammer, and mallet, which every amateur worker owns ; and for fitting together he will want the ordinary soldering-tools and appliances, which, together with the manner of using them, he will find described in Mr. Edwinson's articles on "Brazing and Soldering," in pages 39 and 138, Vol. II., of AMATEUR WORK.

To make the large-winged snake (Fig. 1), pieces of tubing will have to be sawn off to form the neck, and these may be cut to such lengths, and at such angles as will enable them to form the different bends, as shown in Fig. 2. These may be soldered together, with the exception of that piece which is to form the head of the snake (A, Fig. 2), and which should not be soldered to its place till the jaws, wings, etc., have been attached to it.

To form the jaws, two pieces of sheet zinc have to be cut with the shears, of the shape shown in Fig. 3. At the base, each of these pieces should measure about two-thirds of the circumference of the piping. The proper curve can be given by placing the zinc on a cylindrical piece of wood of suitable diameter, and beating with a mallet. The teeth can be turned in the desired direction with the pliers. The bases of the jaws will, of course, have to fit upon the end of the tube (A, Fig. 2) ; and to make them lie better for soldering, it will be well to notch and open the pipe a little at the end, as shown at B, in the same figure.

The lower jaw is first to be fixed in place, and before soldering the upper jaw the eyes should be affixed to it, which are, as shown, narrow strips of

zinc, bent to an oval. It is best first to form them as rings, like those which serve as handles on the lids of cans, and then to flatten them a little before soldering down. The horn and tongue are formed of a single long, narrow strip of zinc, which passes between the joining of the upper jaw and the head, and which is soldered on at the same operation as the jaw.

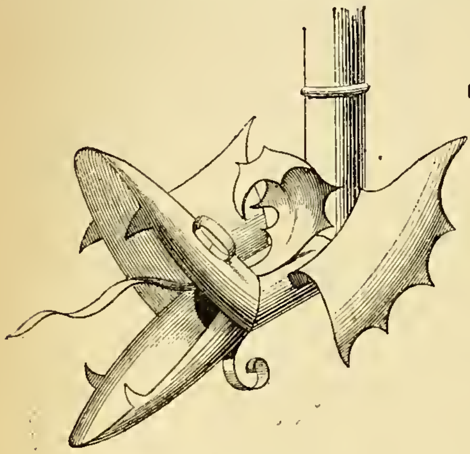


FIG. 6. TERMINAL FOR DOWN SPOUT.

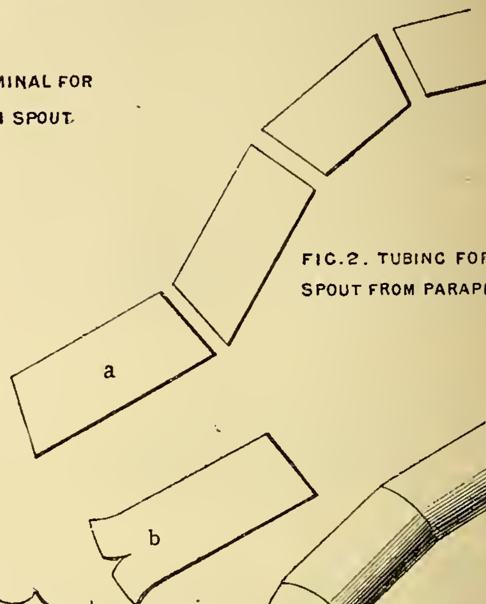


FIG. 2. TUBING FOR SPOUT FROM PARAPET.

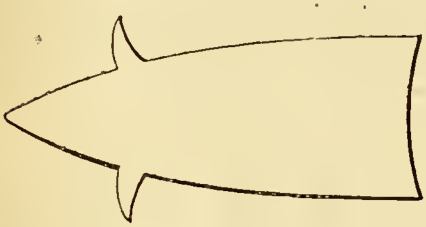


FIG. 4. FORM FOR JAWS.

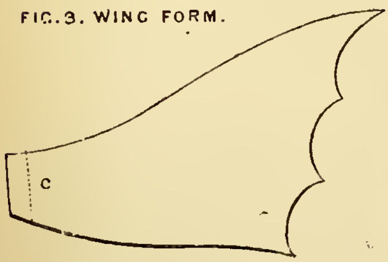


FIG. 3. WING FORM.

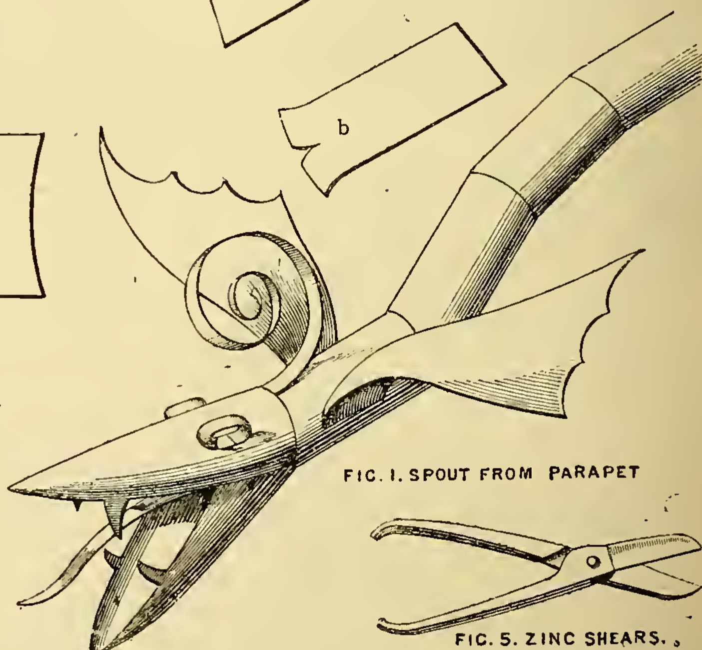


FIG. 1. SPOUT FROM PARAPET

FIG. 5. ZINC SHEARS.

Fig. 4 shows the form of the wing-pieces. To these any curve can be given which may please the fancy of the operator. The dotted line at C, near the base, shows where a piece about half an inch wide has to be turned down, and so beaten that it may fit the side of the head, to which it has to be soldered. All that now remains to be done is to solder the head to the neck.

Fig. 6 is an angle-spout. Its construction is so nearly identical with that of Fig. 1, as to render a separate description needless. It will serve to show how easy it is, with very little labour, to get variety in these things. As a practical point, it will always be desirable to have a tolerably easy curve in the neck, that the free flow of the water may not be impeded; and due regard must of course be paid to the direction in which it is desired to send the water. But, apart from these considerations, a free play may be given to fancy. The material may be so readily cut and bent as to render the most fantastic combinations practicable. Combs, wattles, beards, scales, etc., may be added at pleasure; and if painting be also brought into requisition to give *vraisemblance* to the work, there need be no want of variety or grotesqueness in the results.

NOTES ON NOVELTIES.

By THE EDITOR.

1. ROCHEFORT'S CABINET PHOTO FRAME. 2. ZILLES'S PATTERNS FOR FRET-WORK, HOLLY WOOD, AND SAWS. 3. ZILLES'S NOVELTY TOOL.

1. ROCHEFORT'S CABINET PHOTO FRAME.—A letter has been addressed to me by Mr. Gus. Rochefort, Picture Dealer and Picture Frame Maker, of 29, *Basinghall Street, London, E.C.*, which I produce *in extenso*, and heartily commend to the attention of my readers, as being well worthy of their notice.

"Pardon my bothering you," says Mr. Rochefort, "but by way of acknowledging the kindness of various correspondents who have mentioned my wares in 'Amateurs in Council' in flattering terms, I wish to offer to all who may be disposed to accept it, and who will mention this number—namely, 1117—as a proof that they are amateur workers and readers of this magazine, an opportunity of obtaining at a nominal price a superior frame, measuring 14½ inches by 12½ inches, out to out, with an *imitation* claret-coloured velvet and gilt mount for a cabinet photo, glass, back, etc., as a sort of Christmas present, and also as a medium of introducing to their notice a highly artistic article for home decoration. The frame, I may add, is suitable *without* the mount for a small canvas or millboard oil-painting or water-colour drawing; or the mount may be utilised even for these, if of suitable size. I intend to supply this article for about half its value, namely, for 2s. 3d., carriage unpaid; or for 3s. carriage paid per parcel post. I would willingly *give them away without charge*, for the sake of showing what my goods are like; but I cannot afford to do so, so I give half as a sort of introduction. I leave you, Mr. Editor, to judge of the value of the frame from the specimen sent. If any of your readers, after receiving one, do not like it, or find that it is not everything that it is represented to be, I shall be most happy to return the money paid, *and give, in addition, a handsome reward in money if they can make one at the price to match it.*"

Such is the sum and substance of Mr. Rochefort's letter, and I am inclined to think that many will be inclined to take advantage of his liberal offer. Let me, before describing the frame sent to me, take the opportunity of assuring Mr. Rochefort individually, and my readers collectively, that no one ever bothers me in matters connected with AMATEUR WORK but those who take upon themselves the task of contributing articles and then fail to keep the promise made, thereby entailing disappointment to the readers of the magazine, and imposing on me the necessity of looking out for writers to fill their places—which has been, I regret to say, in some cases, labour utterly lost. This will explain to many of my correspondents who have expressed a wish for papers on certain subjects, why their requirements have not been satisfied. I can only remind them of the old saying, that "everything comes to those who are content to wait," and to assure them that nothing shall be left undone on my part to meet their wants and desires.

The frame sent by Mr. Rochefort is of the outside measurement stated, and is of a handsome pattern, known in the trade as "Alhambra." The inside measurement is 8¾ inches by 6¾ inches, so that the frame would take an oil painting or water-colour drawing of this size. The oval cut in the *outer* claret-coloured mount measures just about 6¾ inches by 5¼ inches, and that cut in the inner gilt mount is about 5¼ inches by 3¾ inches, so that the width of the gilt mount is ¾ inch. The depth or thickness of the frame in its thickest part is 1⅝ inch. I do not think the frame could be bought of makers generally under 5s., and I have seen the advertisement of a photographer in which these frames, *which are supplied to him by Mr. Rochefort*, are sold to the public at 10s. 6d. each.

2. *Zilles's Patterns for Fret-work, Holly Wood, and Saws.*—Mr. Henry Zilles, 14, *South Street, Finsbury, London, E.C.*, has sent me specimens of his fret-work patterns, which I can cordially recommend to fret-workers who are looking out for fresh sources of designs for their favourite work. They are produced by a Munich firm, and, so far as I can judge from the specimens sent, are remarkable for simplicity and boldness of outline, which satisfies the eye in every particular, and this is more than can be said for many designs of this kind. The patterns are of two classes, termed by Mr. Zilles, superior and ordinary. The former are supplied at 3s. per dozen, the latter at 2s. 6d. per dozen. About 300 patterns are kept in stock, of various sorts and sizes, and these, it may be said, are well worth inspection. Fret saws of good quality may be obtained for 1s. 9d. per gross, and the finest holly wood, smoothly planed on both sides, and beautifully white at 1s. per foot super., if I understand Mr. Zilles's mark aright. All goods are sent carriage free at the above prices. The specimens of saws and holly submitted are satisfactory.

ZILLES'S NOVELTY OR WOODWARD TOOL.

3. *Zilles's Novelty Tool.*—The above cut represents a curious little tool, 6 inches long, supplied by Mr Zilles at 6d., or per parcel post at 9d., which satisfies nine different requirements, and therefore claims to be regarded as being nine tools in one. At A is a little wheel, which serves as a glass cutter, and for cutting out paper patterns when laid on glass or hard wood, which are requirements 1 and 2. At B are slots to serve as a saw set for bending the teeth of a saw before sharpening it; at C is a tack hammer; at D knives may be sharpened by drawing them between the projection thus lettered and the piece of steel inserted between D and E; and on the other side, between the steel and the projection E, scissors may be sharpened. These are requirements 3, 4, 5, and 6. The space at F serves as a wrench for screwing up or unscrewing small nuts from ⅜ inch to ¼ inch square, and the broad end G, by aid of two projections behind it, not shown in the illustration, serves as a can opener, or as an ice pick, by striking at the ice with the wedge-shaped point, thus meeting requirements 7, 8, and 9. The tool is a curiosity in its way, and will serve to do in a limited degree, everything that is professed to be carried out by its instrumentality.

AMATEURS IN COUNCIL.

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine, the information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

HINTS TO CONTRIBUTORS AND CORRESPONDENTS.

At the commencement of a New Volume of Amateur Work, it may be useful to give a few hints to Contributors and Correspondents, which if they be carefully attended to and observed, will tend in some degree to lighten the work, Editorial and clerical, that attends the production of this Magazine, and which I find it better, from past experience, to carry out unaided. These hints may well take the form of a few simple rules, which may be formulated as follows:—

1. *All letters on business matters of any kind connected with the Magazine, should be addressed to the Publishers of* Amateur Work, *Warwick House, Salisbury Square, London, E.C. All letters connected with the subject matter of the Magazine should be addressed to the Editor of* Amateur Work *at the same place.*

2. *Contributors are requested to write on one side only of the paper on which their articles are written, and to draw sketches and diagrams in illustration on separate paper. This is necessary because the articles themselves are sent to the printer, and the diagrams, etc., to the artist and engraver; and if MS. and drawings are not separated, it entails on the Editor the work of separating them, that each may be sent to the proper quarter.*

3. *Contributors are requested to write name and address at the end of each paper, so that the printers may send proofs to the proper quarter as soon as the article is in type.*

4. *Correspondents sending letters and remarks for "Amateurs in Council" are requested to observe Rules 1 and 2 in all cases, and to deal with every subject on which they may write on a distinct and separate piece of paper. It is also desirable that they should adopt the form of heading, etc., as ordinarily used in this portion of the Magazine, and to avoid as far as possible the ordinary form of letter writing when sending Contributions of this character to the Editor.*

The above remarks have been rendered necessary because occasionally letters are received in which apologies are offered to the Editor for addressing him at the office of the Magazine, which, after all, is the proper and only place to which communications for him can be sent; and because at times Contributors unwittingly write on both sides of the paper, which is inconvenient to the printer; and draw diagrams on the paper on which they write, when they ought to be put on separate paper for reasons above stated. Correspondents, moreover, frequently mix up several subjects in one and the same letter, whereas it is better and far more convenient that each subject should be kept separate, that it may be treated under a heading that properly belongs to it.

Hydraulic Motor.

Boxwood.—Cato has for some reason or other omitted to give the thickness of wheel in description. According to the end elevation and scale it should be about 3 inches, the total width over case being 5 inches. The paper and whitelead, or paint used in making the joints ought—if the wheel is bored truly—to give clearance sufficient for the sides. I agree with you that the wheel is wide considering the size of jet (¼ inch), unless a great head of water is at command; but seeing that Cato has had experience with such motors, the size given by scale should be accepted: it remains for him to explain whether this is correct or not. Make your buckets of lead, which is easily obtained. It is quite strong enough, and will form an effective rim, obviating the necessity of plugs. After you have fixed the buckets, assure yourself that the wheel is *perfectly* balanced, *i.e.*, no part of the rim heavier than another. If this is not most carefully looked after, a serious loss of power will result.—Olla Podrida.

W. A. K.—It *is* necessary to insert slips of wood all round, to make up for the saw cut which, however fine the saw may be, is a serious consideration where truth is imperative. But if I made one of these motors, I should not cut out the wheel until I had finished the case. I would shape the external contour of rim and sides, and then strike out the inside of rim, and the diameter of wheel from the *same* centre, then mark with needle point, as described by Cato. Next bore holes, and lastly cut out wheel and rim. Another way would be to screw the three pieces together. Find the centre, and drill hole for spindle right through. Then unscrew and mark, with a centre plug in the hole, the inside of rim and diameter of wheel, cutting out as before. In addition to painting, I would suggest a coat of copal varnish on the interior. With regard to the pulleys, make them of wood by all means. Cast iron ones would be rather heavy, thereby causing loss of power. Also, should you require to modify your speed, wood will be found more tractable than iron, and certainly much cheaper. Hard wood, such as mahogany, should be used. Pine is to soft too "hold" on the spindle, unless cheek plates or bushes of metal are used in conjunction. I hope the foregoing will assist you. I should like to hear how you succeed, being interested in this simple but highly serviceable little motor. If this meets the eye of Cato, I would ask him if he has seen the form of bucket in use in the mining districts of California. If not, I should be happy to forward him a tracing of the same.—Olla Podrida.

Hydraulic.—Cato, as I have said elsewhere, has gone to Africa, so be cannot answer your inquiry, nor can he supply his instructions on making a Norfolk Cart, as was arranged. I am not aware that the Hydraulic Motor as described by Cato can be purchased anywhere. If anyone will volunteer to make one for you, and will communicate his address to me, I will forward it to you. The machine must be possessed of considerable power as a motor; but, as I have not seen one in operation, I cannot take upon myself to say whether or not it would work one of Patrick and Son's No. 2 Dynamo Machines.

Cheap Astronomical Telescope, etc.

J. M. (*York*).—Your question on this subject was answered in Vol. III., page 594. I cannot tell you when papers will appear on the subject you mention. I have not yet met with any one who can write upon it. The subject is "Basket Making." Will any one volunteer to write on it?

T. S. (*Glasgow*).—You say you have made the telescope according to the directions given in Amateur Work, Vol. III., page 393, and then you admit that you have not. When I send for an article to any house, I make sure that I shall get what I want, not what they may choose to send, and I am rather surprised that you did not send back the lenses by return post, telling them what you required. I do not wonder that you could not make the telescope, *i.e.*, if the lenses you got are not of the proper foci. Concerning the convexity of lenses, if you refer to my paper, you will see it distinctly stated that the telescope is made with a pair of double convex lenses, and are you not aware that the flatter the surface of the lens, cœteris paribus, the longer is the focus. Instead of questioning the statement of your authority, I can corroborate it. Hoping you may be more successful in the future.—F. A. E.

Old Italian Violin.

J. F. (*Salisbury*.)—You cannot do better than to submit your "good old Italian Violin" to one of the various makers and dealers named by Mr. E. Heron Allen in his papers on the "Violin and its Manufacture." You would then get a fair statement of its value. I am glad to find that the magazine has been of use to you.

Purchase of Lathe and Fittings.

R. H. (*London*).—(1.) It depends on your individual requirements whether you should buy a lathe and fret-saw combined, or these articles separately. If you have not too much room, and yet wish to do both turning and fret-sawing, buy the "combination" machine. (2.) Everything that is made by the Britannia Company is thoroughly good, and can be implicitly relied on. The £5 5s. machine made by this Company is a serviceable one. (3.) You can use the lathe just as it is sent to you. You can add chucks and other fittings as you require them.

Upholstery.

North Stafford.—The author of "French Polishing in all its Branches" has a series of papers in hand on this subject, which you will find to be eminently practical. I am not aware of any practical work on Upholstering, but if any reader is acquainted with one he will doubtless send the information you desire.

Printing Presses, etc.

H. S.—The address of Mr. Berri, the maker of the cylinder press, illustrated in page 505, Vol. III., was, and I believe is, 36, *High Holborn, W.C.* The "Model" Printing Press, is supplied by Messrs. C. G. Squintani & Co., 3, *Ludgate Circus Buildings, London.* It was described and illustrated in Vol. I., page 382.

Engraving on Wood.

CORNELIUS NEPOS.—(1.) The specimens you send of your efforts in this art are very coarse, but still they are such as ought to encourage you to persevere. (2.) I am not myself aware of any advanced work on Wood Engraving that would be of use to you. Marx's Work ought to be sufficient for you. (3.) The tint in the specimen sent is now done by most engravers by aid of a machine, when done with a tool the tool must be used in the ordinary way. (4.) Cross hatching is done precisely as Marx tells you in his book. I do not think you will get on very rapidly unless you have a few lessons. A little showing will aid you more than any amount of telling.

Small Dog-Cart.

J. H. (*New Swindon*).—I had arranged with a contributor for articles on making a Norfolk Cart, but he has been called away to Africa. The author of the papers entitled, "How to Make a Berceaunette Perambulator," will take the subject in hand.

Library Table.

C. W. S. (*Northallerton*).—In reply to your enquiry as to the cost of a Library Table as designed in the August number, you are probably aware that in the construction of a piece of furniture like the one under consideration, the most costly item is the labour, which far exceeds the value of the materials used, and it is here that AMATEUR WORK steps in and assists self-helpers to help themselves. I forwarded your enquiry to Mr. T. J. Syer, 1, *Finsbury Street, E.C.*, who does a good deal of work for amateurs, and I give his reply. "The cost of a table made of oak or ash 4 feet 6 inches long by 2 feet 6 inches broad, with eight drawers and two cupboards, all fitted with brass fancy handles and locks, and the cupboards with hinges. The drawers, made with solid oak fronts and cedar or mahogany sides, backs and bottoms (not pine, as the drawers made of pine would give a very common appearance, and only save about 10s.), inside of cupboards and drawer runners of deal faced with oak or ash, top lined Morocco leather, and all polished, complete £14 10s. If all solid oak, as suggested, £16 5s. The cost for wood alone in the rough, viz.: oak and deal and cedar, cut to sizes required, as near as possible would be £5 5s." I may perhaps be allowed to say that I consider this estimate a very moderate one, for the construction entails a good deal of labour, as no one knows better than myself, and Mr. Syer's name is a sufficient guarantee that you will get sound and thorough workmanship.—[PITCHPINE.]

Bird Scarer.

J. M. (*St. Bees*) writes:—"Allow me to demur to your remarks on this subject in comment on the communication of R. A. R. B. (*Oxford*), page 551. For many years past I have used a similar scare with great advantage. Small circular mirrors in metal cases and covers, about three inches in diameter, can be bought at the toy shops at a penny each—probably cheaper in larger quantities—and they have metal loops by which to suspend them. Pieces of tin, which soon tarnish when exposed, do not reflect the light in the same degree as these mirrors, and it is the suddenness of the flash when the mirror is in motion which constitutes its effectiveness as a bird-scare."—[Your suggestion of the small penny mirror in a metal frame is eminently practical. I was thinking of the difficulty of manipulating small pieces of looking-glass when I mentioned pieces of tin as a substitute.—ED.]

SCOTCHEE ventures to suggest that the pieces of bright tin, instead of being hung from trees or posts, should be soldered or clipped to the ends of thin, hard wires; and stuck upright, either into the ground, into small boards, or into the tops of stakes. The least breath of air would then cause them to flash about the light in all directions with a floppy suddenness and irregularity quite demoralizing to any bird with normally constituted nerves.

Violin Making.

W. F. W. (*Birmingham*) writes:—"J. J. G. (*Brighton*) is not the only person that has made a violin by following the very ample instructions given in AMATEUR WORK, as I myself have made four, which are all very fair tone; and the last one I made—No. 4—I keep myself, and have played on it regularly at home, and in an amateur band every week. I had a great difficulty in making my other playing friends believe I had made it till they saw the name inside. The most difficult part I find is the varnishing; my last I scraped all the first varnish off—a spirit varnish, according to receipt given in AMATEUR WORK—and varnished afresh with oil varnish, which has greatly improved the tone. No. 1 fiddle I sold for 20s., No. 2 for 25s., No. 3 for 30s.; the two last are used and played regularly by two friends of mine, and have been the last six months, and the instruments improve wonderfully. I have no doubt there are many that have made violins by the same instructions with good results. I may also say that I have not gone to nearly so much expense as I should if I had bought all the tools mentioned in AMATEUR WORK, and I here give you a few of my makeshifts, which I found answer very well. I think there are many that would like to try their hand at making one violin, if they had not to lay out so much for tools, according to instructions given, as probably after the first violin is made, or the second, the tools are laid by, and not much use for anything else, makes it a very dear violin. Instead of buying the wooden screws—two dozen, at 6d. each—I got a broom-stick, straight in the grain, and sawed off forty-eight pieces, about ½ inch thick; but, first of all, before sawing off, I bored a hole down the centre with a gimlet, so that when the pieces were cut off each had a hole in the centre; and kept boring and sawing till I got the required quantity. Then I bought two dozen small shutter screws—at about 8d. a dozen, I think—screwed one of the round pieces of wood up to the head of the screw, and one screwed on to the point. I did each one the same, and answered admirably for screwing down the back and belly. For bending the sides, I got an old goffering-iron for 6d., and wet one side of the strips—the outer side—and it answered first-class. I gouged and scraped the inside; made scrapers out of pieces of sheet steel; did the purfling with my pocket knife, and it looks as well as any purfling in any violin you buy. I bought a pair of large S. calipers, which answered very well for measuring the thickness. I shall be very glad to show my instrument to anyone who would like to see, or would gladly give anyone any information from my own experience, being quite an amateur, and never having had anything to do with working wood, as I am a traveller in the corn trade."

L. T. (*Abergavenny*) writes:—"I am most glad to hear of the continuation of Mr. Allen's articles on Violin-Making. The 'maps' of Cremonese violins are kept secret by violin makers, and at no fee offered have I been able to obtain the knowledge which your pages contain. By some makers I was referred (in vain) to others. By others I was handed the geometrical model. I, myself, from Mr. Allen's directions, have made, at least, a dozen splendid violins, worth from £10 to £20 each. The publication of the articles has created an interest beyond the amateur violin-maker." [Well done, L. T.! The "map" of a Guarnerius violin, and a brief description of its points and peculiarities, will appear in this Volume.—ED.]

Finsbury School of Amateur Mechanics.

H. writes:—"Seeing a reference in your last number to the re-opening of Mr. Syer's Classes for Carpentry, Turning, and Cabinet Work, at Finsbury, I think it only fair that I should bear testimony to the benefit my own son, aged 16, has derived from a few weeks' practice at that establishment. I can honestly recommend all parents who have sons growing up at home to give Mr. Syer's system a fair trial. The instruction is good, in fact as good as can be, and they will find their sons not only acquire knowledge most useful in itself, but that home-life will be rendered all the more cheerful by an occupation which is so pleasing and can be carried on so well indoors. I shall be glad to hear of complete success attending Mr. Syer's efforts." [So shall I! I heartily and completely agree with all that you have said with regard to Mr. Syer's Classes, and the benefit derived by those who attend them.—ED.]

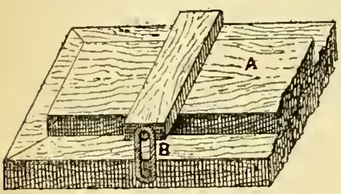
Tinning Iron.

TIN CAN.—Iron plates are tinned by first cleansing them from oxide in an acid pickle, and then passing them through a bath of molten tin. The surface of the molten tin is covered with a greasy flux to prevent oxidation of the metals during the process. Rusty spots on tinned iron vessels around holes may be retinned by first scraping off all rust carefully with a sharp steel tool, then applying a solution of sulphate of copper (bluestone) to the bare iron. It should make the spot appear "coppery," and this must be touched with a little "killed spirits," to prepare it for the soldering process. The faulty spot may now be tinned with a drop of tinman's solder, applied with the usual heated soldering-tool.—G. E.

The Blue Printing Process.

J. H. J. (*Nottingham*) writes:—"Regarding the Rev. G. D. Cox's recent paper on the 'Blue Printing Process' in AMATEUR WORK, I may say that the process was invented many years ago by Sir John Herschel, and called 'Cyanotype' by the inventor. Several modifications of it are at present in use in this country and America. Paper ready-sensitised, under the name of 'Ferro-prussiate Paper,' has been for some time a regular article of commerce. Formulæ for the Blue Process are constantly given in the *Year Book of Photography*, the *Photographic News*, and also in Captain Abney's two manuals on photography. The process is in use in many engineering firms for copying plans, etc. I have never found any difficulty in obtaining potassium ferridcyanide—K_6FeCy_6—of any good chemist in a provincial town. However, if it cannot easily be obtained of some local chemists, paper sensitised with the double citrate of iron and ammonia, and developed either with potassium ferrocyanide, silver, nitrate, or gold chloride, will answer as well."

BING writes:—"Many thanks to the Rev. G. D. Cox for his article on the above. I have tried it with complete success; as an old amateur, I know that cutting down expense in apparatus is a great thing, therefore, Mr. Editor, I beg to call your attention to a much cheaper and easier mode of making printing frame. Instead of hinges



I glue a piece of canvas at A. I do away with the brass springs and mount my cross bars with brass headed nails, and connect them with indiarubber umbrella rings, as shown at B. I think you will admit that by this means there is a great saving in time and money."

P. B. (*Cork*) writes:—"I read with pleasure the remarks of the Rev. George D. Cox on Blue Printing; but it seems strange to me that so few know of the process. It has been in use here for a long time for copying architects' plans, etc., and I have for some years used both it and a similar process, which gives a brown ground, of which I beg to enclose a small print taken from a leaf and frond. I may say that I always use foreign post paper, and find it gives a much clearer impression than the unsized paper. I believe foreign post paper can be procured as large as may be required; what I have used is large letter paper size namely 17 inches by 10¾ inches, when spread out. I also use common window glass cut to the exact size of ½ inch board, and I use American spring clothes pegs to fasten them both together (the prepared paper and whatever I wish to copy between); the pressure keeps the sun's rays from going inside the margin of the print, and so gives me a clear copy. I may also say that I keep both the solutions separate until wanted, when I mix sufficient for the number of sheets I wish to prepare. The solution of ferridcyanide of potassium and ammonia citrate of iron only, become sensitive when mixed. I lay on the solution with a brush such as is used for wetting the paper in a press-copying book in offices. The other solution is made of bichromate of ammonia, 1 oz. in about 8 ozs. of water, with a small piece of French or clear common glue dissolved in the water first. I keep it in a hock bottle, which, being of a red colour, prevents the sun's rays from oxydising the solution. This would answer for anyone wishing to keep the blue solution mixed; and one of those bottles can be got at a wine merchant's for one or two pence—they are very long, thin bottles, and a deep brownish-red colour. In copying any prints used for fret-cutting, I always *oil* the print, and thereby secure a much better copy, as the light gets through the paper, and gives a clearer ground. I enclose, also, a picture-frame copied from one of my friend, Mr. James Walsh's, designs, which I previously oiled; and you will see it is quite clear enough to cut from, even with bad light. I hope my remarks may help some of your readers." [The printings, both in brown and blue, are very clean and good.—ED.]

H. S. (*St. Catherine's*).—In reply to your queries, I think a little practice on your part will answer them all. (1) If the hands are washed directly after using the chemicals no stain of any consequence is left. (2) Red Prussiate will act; the others mentioned will not. (3) If you have failed, I should like you to be more explicit. You say the chemicals were of a bluish-green upon the paper. All I can say is either your prepared paper or else your solution of the *mixed* chemicals must have been exposed to daylight, because the few moments necessary to pour the chemicals upon the paper, even by the light of a candle, would not prevent the chemicals acting upon exposure to the sun, if the instructions given in the article were strictly adhered to I do not well see how anyone with ordinary care can fail of success. "*Nil desperandum*" is a good motto. I hope your future attempts may be crowned with success.—G. D. C.

Folding Tricycle.

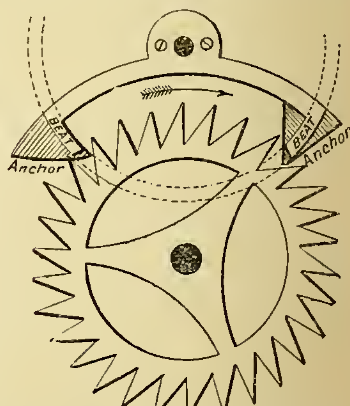
H. K. K. (*Bayswater*).—If you like to write a description of your folding tricycle, and the novel points in its construction, I will consider it with a view to publication. All articles that are accepted are paid for.

Telephone Carbon Transmitter.

P. A. C. (*Brighton*).—An article on this subject by Mr. Edwinson is in my hands, and will appear when I can conveniently find room for it. Of course, every amateur wishes the preponderance of space in the Magazine to be devoted to his own hobby; but, as long as I am captain of the ship, I must be permitted to exercise my own judgment as to the subjects admitted, and when they shall appear. I have once before referred to the fable of "The Old Man and his Ass." It is many years since I have recognized the utter futility of endeavouring to please everybody; and remarks such as those with which you end your letter make as little impression on me as water on a duck's back.

Clock Repairing.

A. H. writes:—"In reply to OLLA PODRIDA's comment (Vol. III., page 548) on my reply to A SUBSCRIBER (Vol. III. page 389), I frankly confess I have never converted an escapement from anchor to dead-beat on the method there described, but do not hesitate for one moment in saying I could do it, and obtain therefrom very good results. A friend and companion of mine, some few years back, converted several by reversing escape wheel. Amongst others were some turret clocks, which afterwards gave satisfaction. With regard to the sketch on that page, I would say it was never intended for a correct escapement, but only to give A SUBSCRIBER some slight idea of the impulse plane. I must inform you, also, I know nothing of drawing, and possess no drawing instruments. I have sent another sketch of the anchor escape wheel reversed, with anchor pallets, as they may be conveniently altered for dead-beat. I do not say that this sketch is quite correct, but near enough to show my meaning. The pallets may want softening and cramping, and when correct hardening again. I believe any person with a fair



REVERSAL OF ANCHOR ESCAPE WHEEL.

knowledge of the escapement could accomplish the alteration. With reference to the escape tooth, it is not necessary to have it the shape shown in figure by OLLA PODRIDA, though very good, and used in first-class work. The old dead-beat escape tooth is a long thin one. Formerly the pallets were made to embrace fifteen teeth, and until recently ten; but now many escapements are made to embrace but eight. If the converted escape wheel teeth should require a little cutting, it may be done carefully with a file; but, as a rule, there is plenty of space between the teeth. If the wheel is a good one, I would say, try the conversion; if not, by all means have a new wheel and pallets (dead beat). It amounts to this: you lose nothing in trying, but you gain experience. If you even fail in the attempt, you can then have a new wheel and pallets, and your clock will be none the worse for the experiment."

Indiarubber Bands for Gearing Slide-Rests to Mandrel.

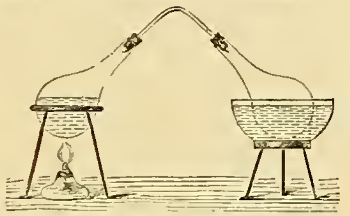
A. F. S. (*Dresden*) writes:—"Your correspondent, J. L., says, in page 545, Vol. I., it is impossible to use indiarubber bands for gearing slide-rests to mandrels. Has he ever tried? Perhaps he had not the right sort of rubber, or the right sort of groove. I have too many irons in the fire just now to make the experiment. But I am sure it could be done. As to the cap, I pity his taste, and I think all German makers will do likewise. It MAY look neater, but it is certainly clumsier. I have never yet met with a slide-rest which could not be turned round. All rests that I have met with here will turn entirely round, there being a circular Λ-groove. The Λ groove I hold is easier to make than the ⊥. I have not found German work inferior to English; but it is if anything superior to what I get over. It is far from being cheaper than English.—P.S. In looking over some papers just now, I came across a stretch of rubber band gearing. I observe it is only for turning spirals and overhead gearing. The wheels are provided with clips (I believe this is the correct name), at the least resistance the band jams in the clips, and cannot slip. Whether it would do for screw cutting is another thing.

Conversion of Gallery or Verandah into Smoking Room.

R. P. (*Demerara*).—By your plan it appears that running along the front of the drawing and dining-rooms of your house there is a covered gallery lean-to, 9 feet in width, which you propose to open into the rooms, keeping a passage between the rooms as now existing, through the addition of the steps leading to the garden. The first thing of importance seems to be the character of the opening into either portion, that you propose making in lieu of, or in addition to, existing doorways. I imagine that the wall, for structural reasons, must be only pierced, and not entirely cut away—so that the additional part will be in itself almost independent of the rooms. To take the smoking-room part first: this might be connected with the dining-room by cutting the wall at about 3 feet from the floor the whole length, to within a reasonable distance of the ceiling, the needful support being afforded either by short iron pillars or brickwork left at intervals, the object being to get an effect somewhat like a cloister—each opening being a rough square (or with low-pointed arch, if you desire to keep a mediæval character). As it is impossible, without scale drawings, to give exact description, I will assume that the wall allows one such opening on one side of door, and two or three on the other. If the openings are left square with brickwork pillars, they may be filled either with the reproduction of the Cairo turned lattice work (as described in page 559, Vol. II. of AMATEUR WORK), or by stained glass—either the actual material, or an imitation in Byssophanie—or glacier decoration. If the oriental lattice work be chosen, the fittings of the room may be easily made to harmonise. As the necessary description is too lengthy for this portion of AMATEUR WORK. It must await treatment in a special paper, that has been partly written for some time, and will appear in an early issue. For the comfort and convenience of smokers, a low fixed seat with cushions and padded back might go entirely round the room—or, at least, on two sides of it—the wall space above being hung with Lincrusta, or Japanese leather paper, or Indian matting; a hanging oriental lamp being suspended from the ceiling, which should itself be decorated. For the drawing-room annexe, a more ordinary opening might be adopted, while some simple scheme of decoration, such as that lately adopted by Mr. Whistler in his "arrangement in flesh colour and grey," would be an easy and pleasant decoration. For those who did not see the room I have named, it must suffice to say the wall surface was flesh colour distemper, the ceiling and dado pure white, the skirting, dado, rail, and all woodwork being mouse-colour grey; curtains or hangings grey plush or white muslin. An alternative scheme of colour might have pale primrose walls, dull, but not dark, blue woodwork, with white and gold hangings. India matting being used for the floor in either case.—J.W.G.W.

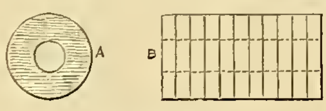
Cheap Still.—Cork Shields for Corns.

L. R. writes:—"Here is a sketch of a cheap still. Procure two Florence oil



CHEAP STILL.

flasks, two corks, and a piece of glass tube of the required diameter. Bore the corks to fit the tube, bend the tube over the spirit lamp to the required curve, fix it in the flasks, put one flask over the lamp, and the other in a basin of cold water. Caoutchouc corks, bored, may be obtained at Townson and Mercer's, 89, *Bishopsgate Street Within*, at from 4d. to 7d. each, and cork-borers at 10d. per set of two, and 2s. 6d. per set of six. If the amateur bores corks for his still, he may as well bore some for his toes if he is troubled with corns. The holes must



CORK SHIELD.

A, Plan of Cork Bored; B, Elevation, showing how to cut Bored Cork into Shields.

suit the size of his corn; he must then cut slices off the cork, according to the depth of the corn, and apply to one side some adhesive, as diachylon, cobbler's wax, or rosin, with a hot flat piece of iron; or he may use gum or glue."

Framework for Hand-Painted Screen.

R. P. (*Demerara*).—As it is impossible to describe the screen frames without diagrams, a paper on this subject will be given very shortly in this Magazine.

Spencer's Instantaneous Polish.

GALLIA writes:—"Seeing the above recommended in AMATEUR WORK, I tried it, and can only corroborate what was then said. I would advise all my brother fret-carvers to try it. The cost is 6d. per bottle, and Messrs. Spencer and Sons' address is 93, *Pentonville Road, London, N.*"

C. G. H. C. (*Penge*) writes:—"I have tried Spencer's Instantaneous Polish, as recommended by a correspondent of AMATEUR WORK, and although I have never before tried my hand at French polishing, I was able, by the use of this polish, to get a very brilliant and clear surface on a piece of mahogany; I also tried it on some other kinds of wood, and found it a grand success."

Enlargement of Photograph.

HENRICK.—You must get a negative from an ordinary photograph in the usual method in order to copy it. A description of the method used in enlarging a photograph is given in p. 465, Vol. III., which please see.

Travelling per Kite.

ONE OF THE RISING GENERATION asks:—"(1) I have seen pictures somewhere of people travelling by kites. Can you tell me how it is done, please? (2) Is it only possible to travel on terra firma? or can you travel in mid-air as well? (3) What will be the probable cost of kites?" [To this I can only reply: (1) I have never seen pictures of people *travelling* by kites, although I know that there are people in this world who try to add to their means by *kite-flying*. I think you must be alluding to kite-flying in China and Japan, which is carried on extensively as a national sport, and have taken your idea from pictures of this, which I have seen I think, in *The Illustrated London News*, some years ago. If the kite were strong enough and large enough to take you off your legs, you would have to go wherever the wind carried the kite. You could exercise no controlling power over it, and you could not come down when and where you would. And consider the mess you would get into if the strings of other kites crossed yours. (2) Have you ever seen a boat or a balloon? If so, you must know that it is possible to travel by water and through air, as well as on *terra firma*. (3) It is not possible to reply to your third question.]

And now let me ask you *one* question in my turn. Do you not think—if you can think at all—that the exercise of a little common sense and a moderate amount of reflection would have saved you from asking, and me from answering, as far as I have done so, *three* such palpably ridiculous queries as those you have propounded above? I find a place for them for much the same reason that farmers nail hawks and magpies to a barn-door when they have shot them.

Copal Varnish.

L. T. (*Abergavenny*) writes:—"I see in Vol. III., page 541, a recipe for making copal varnish, under the heading 'Useful Varnish.' Let me say that copal is quite insoluble in rectified spirit. The gum should be reduced to powder, and mixed with an equal quantity of oil of rosemary until it becomes a jelly. Then add absolute alcohol gradually, shaking the mixture. This gives a crystal varnish. A water bath assists."

Sensitised Paper.

J. H. H.—You will find the method of making sensitised paper in most manuals on Photography, but it is considered better to buy paper of this kind ready-made, and to keep it in a book of white blotting-paper soaked in a solution of carbonate of soda and then dried, rather than to prepare it at home, because home-made paper, as a rule, does not keep good more than a few days. I may add that paper may be sensitised by allowing it to float face downwards on a solution of nitrate of silver of from 40 grains to 60 grains to 1 ounce of water in a flat dish. The paper should remain in contact with the solution for about three o four minutes, and must then be drawn away over the edge of the dish and hung up in a warm room to dry. I cannot notify your want of a lens in the "Sale, Exchange, and Purchase Columns," because you have omitted to send your address. Please repeat your requirement, adding the necessary information.

Induction Coil and Electro Motor.

A. D. (*Plymouth*).—Your wishes for instructions for making a large Induction Coil on the Rheimkorff principle, and an Electro-Motor for Lathe, shall receive attention at the earliest possible opportunity; but I have so many good papers awaiting publication, that if the Magazine were double its size I could fill it easily and profitably. I thought the R. M. B. were in Stonehouse—they used to be there when I was a boy—but perhaps now "Plymouth" cover the "Three Towns."

How to Address the Editor.

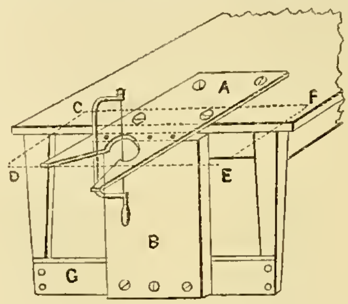
Nero.—You will find your "want" inserted in the proper place. You gave me rather a wide address in "*The Editor of Amateur Work, London;*" but the postman brought it to the right quarter. My full address is "*The Editor of Amateur Work, Warwick House, Salisbury Square, London, E.C.,*" as per wrapper of Magazine in imprint of Publishers.

INFORMATION SUPPLIED.

Support for Wood in Fret-Sawing.

R.T. writes in reply to M.E.L. page 551:—"Your difficulty will be met by providing yourself with what is known amongst cabinetmakers as a 'donkey.' This consists of an ordinary stool with the usual notch cut in the end, and two boards about 7 inches wide, 1 inch thick, and long enough to reach from the floor to about 12 inches above the face of the stool. These boards are connected loosely together at the bottom end with a leather hinge, after which one of them is firmly secured with a few nails, over the notch to the end of the stool, the two pieces or cheeks are then held flush with each other, while a few holes are bored with a ½ inch bit in the upper portion. This done, a slip of wood, the thickness of the work in hand, is dropped between the boards at the bottom, and the worker sits astride the stool with his foot in a loop made in one end of a piece of rope, the opposite end of which is first passed through the notch and then through the most suitable hole in the cheeks. Now, it is evident that a knot made just outside the outer cheek while the foot is an inch or so clear of the floor will give the operator complete control over his work, and leave the hands at liberty to manipulate the saw without fear of breakage. At the same time an additional advantage is gained on account of the erect position of the body and the greater facility of observing the various lines. Failing a stool a piece of stout board may be substituted by resting it on the seat of a Windsor chair."

E. B. (*Lincoln*) writes:—"In reply to M. E. L., I am a lover of fret-work, and have been in the same fix as yourself. I have tried all dodges, but I find the one figured in the accompanying illustration answers very well. In fact, I think that nothing can be better for that purpose, for it not only saves the breaking and bending of the saw-blade, but is a good firm support for wood, and makes an excellent saw-table. The support for wood, A, can be made out of stuff 11 inches wide and 1 inch thick, of any length, as required, cut in the shape shown in the illustration, and fastened to the table with four screws. An upright



SUPPORT FOR WOOD IN FRET-SAWING.

support to prevent damage to saw when putting it into the frame is shown at F. After the blade is through the hole bored in the wood to be cut, let the handle of saw frame rest against the upright support B, as shown; then you will find that the blade can be fastened into its place without any damage to saw. The dotted lines, forming C D E F, show position of wood ready for work. The upright support B is fastened to a cross rail, G, to keep it in its upright position. The cross rail is screwed to the legs of the table. The best fret-saws, I believe, are those supplied by Messrs. Harger Brothers, *Settle, Yorks.*, 2s. per gross, called German fret-saws. I find these answer well, and are not so brittle as some I have used."

J. H. H. writes:—"Would you kindly permit me, in answer to M. E. L., to say that the wood may be held in several ways. Perhaps about the best would be to get a friend to do it; but if he wishes to be independent, he may hold the work between his knees; or lay it on the table and place a weight on it (it need not be a very heavy one); or he might shut the end of it in a drawer, pressing the drawer with his knee, unless the work were very delicate." [I am afraid your suggestions will not help M. E. L. very far.—Ed.]

Long Straight Lines in Inlaying, etc.

R. T. writes in reply to J. B., *Stowmarket*, page 447:—"These may be produced lengthwise of the grain by first carefully removing an inch or so at each end of the groove with a narrow chisel, and the intervening portion with a cutting gauge, in which a bradawl of the proper width may be inserted as a cutter. Commencing at the front end of the groove work backwards by short strokes, the point of the cutter describing a curve by imparting a circular motion to the tool with the wrist. For working across the grain each side of the groove must first be cut with a fine pointed marking gauge before the cutting gauge is applied. When the grooving is completed prepare some thin hot glue, and with this proceed to press the strips into position with the back or bevelled face of a chisel held in the right hand, while the strip is guided and supported in the left, neatly squaring or mitring the ends as the case may be, lastly finishing the surface off quite smooth with the scraper. In connection with this subject I may remark that all kinds of fancy and stained woods in strips suitable for inlaying, etc., may be procured from Messrs. Samuel Westlake & Son, Mahogany and General Foreign Wood and Veneer Merchants, 13, *Tabernacle Walk, Finsbury Square, E.C.*

Etching and Copper-Plate Printing Press.

J. Y. S. writes:—"In answer to Lancet, I advise him not to try to make a printing-press. The cost of the material and the labour of putting it together would fetch the price as high as he could buy a new one for. If he wants it cheap, he can obtain a good second-hand press from Hughes and Kimber, who have always several for sale. Copper-plate, as used by engravers and etchers, is sold by weight, not by measurement, so it is impossible to answer the question; but if the copper is thin, I should think the price would be less than 2s. There are various thicknesses used, but I should advise him not to get it very thin, as it is more difficult to print from, and not so easy to etch upon as the medium or thick plates."

R. L. J. (*Horsington*), writes in answer to Lancet, that Berri's Cylinder Press, illustrated in page 505 of Vol. III., with the addition of a plate of iron or hard wood in place of the chase, and a blanket on the cylinder is perfectly suitable for copper plate printing. The engraving shows the construction of the press plainly.

Walking Sticks of Rhinoceros Skin.

H. K. K. (*Bayswater*) writes in reply to C. R. (*Liverpool*):—"I have frequently made sticks in rhinoceros horn and skin, and shall be happy to give him any assistance that lies in my power, or do them for him."

Removal of Lime from Kettle.

K. Q. writes:—"Olla Podrida (see page 550, Vol. III.) does not seem to be aware that muriate of ammonia is the chemical name of sal-ammoniac, and is the same thing. If the kettle is filled with *rain* water and boiled, it will in time remove the fur. The rain water contains no lime, and will dissolve a certain quantity of that attached to the metal. The time required will depend upon the amount to be removed. The water

must be frequently changed. This plan has been found efficient in cleaning out the tubes in locomotive boilers."

INFORMATION SOUGHT.

Electrical Locomotive.

R. L. J. (*Horsington*), writes:—"I am very desirous of making a small electrical locomotive to run on rails and to be supplied with current through them. Such engines are often seen in opticians' windows, and are priced in most of the catalogues of scientific apparatus, but I cannot find any description of their working in any book or magazine I have, and I should be very glad of any hints, or reference to description in book, etc."

Lens for Camera Obscura.

A. C. B. writes:—"Having made the camera obscura by the instructions given in page 90, Vol. III. of AMATEUR WORK, by T. EARL, I went to an optician to procure the 'Double Convex Lens,' but he wanted to know the size and power of the lens. I would be very much obliged if T. EARL would tell me this."

Old Red English Penny Stamps.

C. G. H. C. (*Penge*) writes:—"Can any reader tell me of any use for the old red English penny stamp? I have some thousands of them, and am at a loss to know what to do with them."

Articles in Glass Bottles.

A LAME MILLER OF NORWICH writes:—"I was at an industrial exhibition held at Norwich in March last, and there I saw a cross, a ladder, a mallet, and spikes, representing the implements used in the crucifixion of our Saviour. These were all nicely arranged inside a bottle of water. Can any reader of AMATEUR WORK tell me how they were got inside the bottle, which was a small-necked one? And what was the water for?"

Joining Tortoiseshell.

L. S. D. (*Jamaica*) writes:—"Can any reader give me a receipt for joining and mending articles of tortoiseshell? I have tried applying linseed oil to the surfaces to be joined, and using a hot compress, but without success."

Thompson's Liquid Enamel.

L. S. D. (*Jamaica*) writes:—"Will H. S. (*Hackney*), or any of your readers who have tried it, give me their experience of Thompson's Liquid Enamel. I obtained excellent results at first, but I find now that the articles on which it was used, after exposure for three or four months, have entirely lost their lustre. Mr. Thompson unfortunately gives no directions for its use on his cans; but according to the instructions given by H. S. in page 397, Vol. II., I used it in the same way as French polish, and succeeded in getting, with far less trouble, what appeared to be a beautiful and lasting polish; but, alas! with the result above mentioned. After two or three months, it gradually faded away, and the articles have now a dull, sticky appearance, which is not the case with those on which ordinary French polish was used. Possibly it may be affected by the warm climate."

Lapidary's Lathe.

PYRITES asks:—Will any reader give me instructions (with drawings) for making a lapidary's lathe; also, for grinding and polishing mineralogical specimens? I should also like to learn how to make a cabinet for holding specimens.

Gregorian Reflecting Telescope.

H. M. H. asks:—Where can I get one of the old-fashioned Gregorian Reflecting Telescopes put into order, and the steel mirrors re-silvered? I called at Mr. Browning's, in the *Strand*, and the assistant told me that these mirrors were quite out of date, and could not be repaired now. Perhaps some of your many readers may know where this kind of work is undertaken.

Black Varnish for Telescope Tubes.

H. M. H. writes:—"I should be glad of a recipe for making the dead black varnish with which telescope-makers coat the inside of the tubes."

Catch 'em Alive!

H. M. H. writes:—"Can any reader kindly tell me how the sticky substance is prepared, with which paper is coated for killing flies, and hawked about under the name of catch 'em alive?"

Compound Marine Engine for Model Launch.

S. M. L. (*Goderich, Canada*) asks:—Will some amateur engineer give me a drawing and specification of a simple design for a compound marine engine (for a model launch)? also, I require the proper size of boiler for engine 1 inch by 2. Different makers seem to have various sizes, and I cannot determine the correct size for above.

Cement for Waterproof Sheets.

LOCO (*Sohagpur*) asks how to make cement, such as is used for joints for fixing up waterproof sheets and clothing (mackintosh).

Organ Keys, their Price, etc.

W. W. (*Norwich*) wishes to know where he can get organ keys, or an organ keyboard, and the price.

Waterproofing Textile Fabrics.

SCOTCHEE desires to learn something about waterproofing textile fabrics by means of the sugar of lead and alum process. Will the Editor, or some brother amateur, kindly tell him the necessary strength of the solutions, whether they should be used hot or cold, how long immersion should last, and give him any other practical information that may appear needful? He might send his model to a waterproofer's, but thinks it may be advantageous not to communicate his idea until he has elaborated and patented it.

Paper Roofing Material.

FRANK ST. CLAIR wishes to know if any reader can inform him of an inexpensive and simple method of covering a shed or workshop of wood so as to prevent rain from penetrating. Roofing felt I find is not durable. I have seen an announcement of a waterproof paper, called Willesden Paper, I think, and the idea struck me that thick paper wrappers (such as are used around reams of paper) might be prepared in some way to answer the purpose; would tar or pitch serve to make the paper waterproof, and what would be the best mode of applying? [I insert your query here instead of replying to it positively, that you may have the benefit of information from other sources. The "Anglo-Danish Patent Asphalte Roofing Pasteboard," supplied at 1d. per square foot, by Messrs. H. Atkinson & Co., 33, *Wharf Road, City Road, London, N.*, might meet your want. I believe the Willesden Paper is an excellent material, but I would rather use sheets of corrugated iron or zinc myself than either of these. The following clipping from the *Standard* of September 17, 1884, may be useful to you and others:—"Zinc and Iron Roofing, damaged cargoes, half price; all sizes, 5 to 10 feet; sample single sheet, 1s.; estimates and samples free; best roofing, special low quotations. Electric battery plates, patent chimneys, perforation 8 by 3, 3s. 6d.; zinc edging, baths, etc.—North's, *London Road, Southwark*."—ED.]

Mould and Matrix for Type.

FRANK ST. CLAIR writes:—"I, like J. R. of *Ballater*, have wished for some information on typefounding, and his hints are valuable. I am sorry, however, he cannot furnish plans of his mould. Of what did he make his mould, iron or steel; and how could it be opened to release letter cast without disarranging the gauge he had set it to to cast the letter? If he can give further information I shall be grateful."

W. T. M. (*Kilburn*) writes to the same effect, and wishes for the address of J. R. (*Ballater*), which shall be forwarded to him, if J. R. will send it.

H. S. wishes to know how J. R. (*Ballater*) made his mould and matrix for type. (See Vol. III., page 541.) Will J. R. supply the information required.

Separate Ventilation for Rooms.

A WANDERER writes:—"I shall be much obliged for any advice or personal experience on the subject of Separate Ventilation for Sitting and Bed-rooms. With Kite's and other patents, the inlet seems simple enough; but I am inclined to try an *outlet* of zinc piping from over the gas. It seems to me that this is a better position, and will do away with the fear of having one's new papers damaged from a fall of soot, which danger always seems an objection to the 'chimney breast' ones."—[I failed to find your card. Perhaps it will be as well to send your name. I have your present address.—ED.]

Saltpetre in Walls.

MATTHEW STICKLEBACK asks:—How can saltpetre be prevented from coming out in walls? The walls are old brick with fat lime mortar, covered with plaster. Mixing alum with the plaster has been tried and failed; perhaps the proportion was wrong. If alum is really a good remedy can anyone tell me in what proportion it should be used.

Gravity Cell for Electric Bells.

MATTHEW STICKLEBACK asks:—Is there any reason why these cells should not be used for electric bells? They are easily made up, and the materials in this country (India) are cheap. Similar cells are used in this country for the telegraph.

SALE, PURCHASE, OR EXCHANGE.

Persons availing themselves of this Department of AMATEUR WORK *are requested to note that—*

(1) *No Trade Advertisements can be inserted in this Department, which is open to bonâ fide Amateurs only. The Editor reserves the right of refusing to insert any notice.*

(2) *No charge will be made for the insertion of notices until their number be such as to render it absolutely necessary to do so.*

(3) *Persons writing in reply must forward application under cover to the Editor, in an envelope sealed down, with a Penny Stamp attached in the upper right hand corner, and the* NUMBER *of the notice in the lower left hand corner thus :—*

	STAMP here.
NO. OF NOTICE here.	

(4) *Letters thus marked and enclosed under cover to the Editor will be forwarded immediately to owners of articles for Sale or Exchange, or persons wishing to purchase. No attention will be paid to any communications in which these Rules are not strictly observed.*

103. Busson Organ Accordion and Stand. —First class, both as good as new, little used, every note perfect, cost £4; will sell for 50s. Purchaser to pay carriage.

104. Model Horizontal Steam Engine and Boiler.—Well finished, all brass, splendid worker, cylinder ½ in. bore 1 in. stroke, both on polished stand. Price 25s., worth nearly double. Purchaser to pay carriage.

105. Books Wanted.—Back numbers of "The Amateur Mechanic," from commencement to August, 1884. Will buy for cash, or give in exchange a pair of *Roller Skates*, almost new.

106. "Amateur Work." — Back Parts from commencement wanted. Will give good price, if perfect and clean.

107. "Every Man his Own Mechanic." —In exchange for this will be given "A Treatise on the Construction of Staircases and Handrails," and "The Carpenter's and Joiner's Assistant," two vols., by Peter Nicholson, or, "The Popular Recreator," complete in one volume.

108. Hektograph. — In mahogany case; will copy letter 9½ by 5½ in. Cost 5s., will take 1s. 9d.

109. Wooden Chest, of 1 in. deal, brass hinges, lock and key. Outside measurement: 35 in. long, 24 in. wide, 23 in. high. Wants painting. 5s. Purchaser to pay carriage.

110. Prize Holly Fret Machine, in good condition, cost 16s. Will sell for 10s., or exchange for Bookbinder's Cutting Plough, or AMATEUR WORK, Parts I. to XXIV. inclusive.

111. Illustrated Carpenter and Builder. —For sale, Nos. 28—53, 109—239, and 248—346, in all, 251 Nos.; in pretty good condition, but a few a little damaged. What offers in cash? Will exchange for book on Engineering or small Lathe Heads, etc.

112. "Amateur Work."—Wanted to purchase Vol. I., bound. Must be in good condition and cheap.

113. "Amateur Work."—For sale, Parts I. to XXXIV., perfect; will take 9s. 6d. Purchaser to pay carriage.

114. Manual Pipe Organ, Three Stops—Dulciana, Stopped Diapason, and Principal; pedals, side blower, handsome mahogany case with gilt front pipes (dummy). In perfect condition. Price £25 cash.

115. Large Working Model of Stage, complete, with trap doors, slides, flies, plays, etc. What offers?

116. Birchwood Organ Pedals and Attachment for Piano (Hamilton's).—Full set. What offers, either in cash or exchange for old carved oak?

117. Dickens's Novels.—Wanted to purchase *original Edition*. Must be in good condition.

118. "Amateur Work."—Wanted, Parts I. to XV. and XXVI. to XXXIV., inclusive, in good condition, and cheap. Will give cash or useful exchange.

119. One-Manual Pipe Organ. — Six Stops, GG to E, 58 notes, 364 pipes, all metal, except one stop of wood; two octaves of pedals to pull down keys, enclosed in general swell. Recently overhauled and thoroughly repaired. Price £15.

120. Six Stop Organ Sound Board.—Second hand, complete; bellows for same, and pipes. [No price quoted.—ED.]

121. Square Grand Piano.—Handsome instrument, by Broadwood, in mahogany case; newly re-strung and repaired. In good condition. Price £8 8s.

122. Large Magic Lantern.—Has 3¾ in. double condensers, shows 10 foot disc; Argand oil lamp, only used four times. Made by F. Cox, *Ludgate Hill*. Also about 12 Hand-painted Slides, various, and Box of Colours, new, for painting slides. Price for whole, packed in neat black box, 45s.

123. Wood for Violin-Making.—Wanted, cheap for cash, a few Sets of Woods, Scroll Fittings, etc. Advertiser will give fair price for old well-seasoned sycamore, maple, pine, etc., suitable for violin-making, though not in regular wedges.

124. Combined Lathe and Fret Saw, Britannia Company's.— In perfect condition, with two buff wheels, saw stand and circular saw, two T-rests, oilcan, turnscrew, emery wheel, and carrier chuck. Cost over £7; will take £5 10s.

125. Photographic Camera.—Wanted, a ½ Plate Bellows Camera, double swing back, vertical and horizontal movements to front, hinged focussing glass, double dark slides (dry plate) or changing box, portable tripod, with good all-round work lens. Or would treat for a Lancaster ½ Plate Instantograph, if in good condition. Full particulars and lowest price to be sent.

126. Magic Lantern Condenser.—Wanted, 4-inch Condenser, and Achromatic Rack and Pinion Focussing Lens.

127. Model Yacht, Clinker built, of mahogany; 32 in. long, 8 in. beam; beautifully built and rigged. No toy, but good boat for sailing. Price 25s.

128. "Boy's Own Paper," Vol. I. bound in cloth; Vol. II. in monthly parts, slightly soiled, one missing; Vols. III., IV., and V. in weekly numbers, perfect and clean. Will sell for 17s. 6d., or exchange for AMATEUR WORK, Vols. I. and II., and "Every Man his Own Mechanic." Must be clean and perfect.

129. Small Magic Lantern, by Solomons, of *Dublin*, gives disc from 3 to 4 ft. diameter, with lamp, and box of slides comprising over 30 pictures. Price 5s. 6d., purchaser to pay postage.

130. Parkhurst's Hebrew Lexicon.—Large thick volume, price 4s. 6d. Purchaser to pay postage.

131. "Amateur Work."—Vols. I. and II., in Parts, as clean as when received from publishers. Price 12s. Purchaser to pay postage.

132. "The Spectator," Vol. I., edited by Henry Morley; 687 pages for 3s. Purchaser to pay postage.

133. "English Mechanic." — Twenty-four Vols., viz., Vols. VIII. to XXXI. inclusive; Vols. XVIII. to XXVI. (9 vols.), are in good binding; the others unbound, but all clean and perfect. What offers?

134. "Amateur Work."—Wanted, Parts I. to XXXIII. inclusive, clean, with all plates, etc. Will give half published price and pay carriage.

135. Soundboard and Reeds for Harmonium.—Wanted, for cash, for barmonium of 5 octaves, which advertiser is building, a Soundboard and Reeds, ready put together, of 5 octaves. Also a Keyboard of 5 octaves, from CC to C, separate, or Reeds and Keyboard separate, and no Soundboard, might do.

136. Dalmeyer's Rapid Rectilinear ¼ Plate Lens.—Wanted, this lens, or Ross's Symmetrical, in exchange for a Dalmeyer's Wide Angle Rectilinear ¼ Plate Lens and Gold Scarf Ring, cost 52s. 6d., never worn. Or will give lens and cash.

137. Folding Caricature Screen, measuring 6 ft. by 6 ft., covered with coloured caricatures of men of the time, professional and political, about 100 in number, the heads being attached to other bodies. Will sell for £2, and send it, carriage paid, to any part of United Kingdom, or exchange for anything of value of £2.

138. "The Graphic."—Five Vols., viz., July to Dec., 1880, Jan. to June, 1881, July to Dec., 1881, July to Dec., 1882, and Jan. to June, 1883. Will sell for 35s., or exchange for tools, etc.

139. Miscellaneous Music and Books.—The advertiser has a quantity of these for sale or exchange. Wants Back Parts of AMATEUR WORK.

140. Electric-Magneto Machine.—Very powerful, complete and perfect, nearly new, in polished box; instructions in box; could be used by child; useful for nervous disorders, toothache, neuralgia, etc. Price £1.

141. Books, Various.—"Popular Scientific Recreations," bound; "Dictionary of Medicine," by Dr. Lankaster, bound; Spon's "Workshop Receipts." What offers in cash or exchange?

142. Small Book Cabinet Wanted, without glass front, for cash or exchange.

143. Sewing Machine Stand, in good order. Price 7s. 6d.

144. Old Book, "History of Reign of Queen Elizabeth," with "Full Account of the Gunpowder Plot." Title page and 19 engravings on steel. 8vo, calf. Date, 1625. What offers?

REPLIES DEVOID OF GENERAL INTEREST.

MATTHEW STICKLEBACK.—Your paper has been safely received, and is accepted. I am always pleased to have anything from you.

PHILO.—You may send in the articles you name for consideration, but, if accepted, I cannot promise early publication.

AMICUS.—Your communication has been forwarded to Mr. Wicks, and shall appear with his remarks upon it.

COMMUNICATIONS RECEIVED AND UNAVOIDABLY HELD OVER.—F. C. A., T. B. T. (*Carnew*), J. J. C. (*Dundalk*), SHODOONEKH, IGNORAMUS, ROUGH (*Scilly*), G. T. W. P., K. Q., WHITTLESFORD, J. H. (*St. Helen's Road*), J. R. (*Manchester*), A. F. S. (*Dresden*), K. G., NOVUM SARUM, A PRACTICAL CARRIAGE BUILDER, ROSELEA, RABBIT SKIN, FESTINA LENTE, TWIST DRILL, F. A. E., EBB AGE, P. A. C. (*Brighton*), D. S., H. K. K. (*Bayswater*).

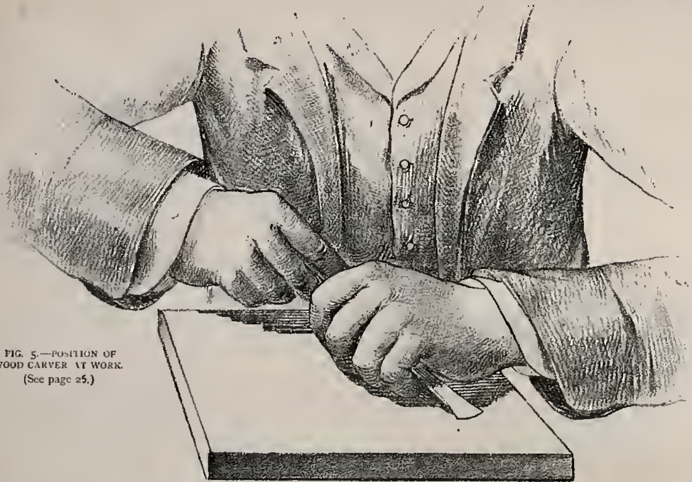


FIG. 5.—POSITION OF WOOD CARVER AT WORK.
(See page 25.)

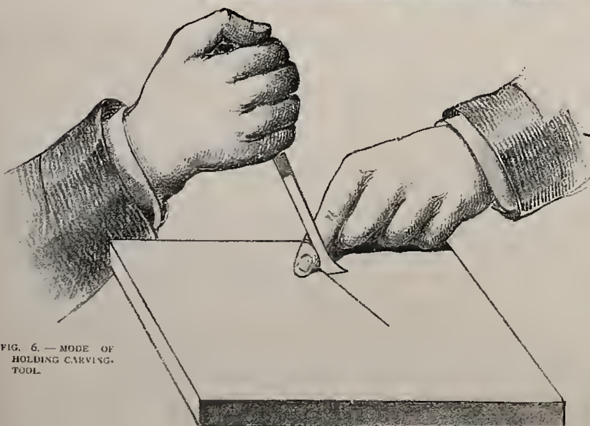


FIG. 6.—MODE OF HOLDING CARVING TOOL.

DESIGN

FOR

CARVED INKSTAND,

WITH ILLUSTRATIONS OF

POSITION OF WOOD CARVER AT WORK

AND

MODE OF HOLDING CARVING TOOL.

BY

E. ARTHUR EDWARDS.

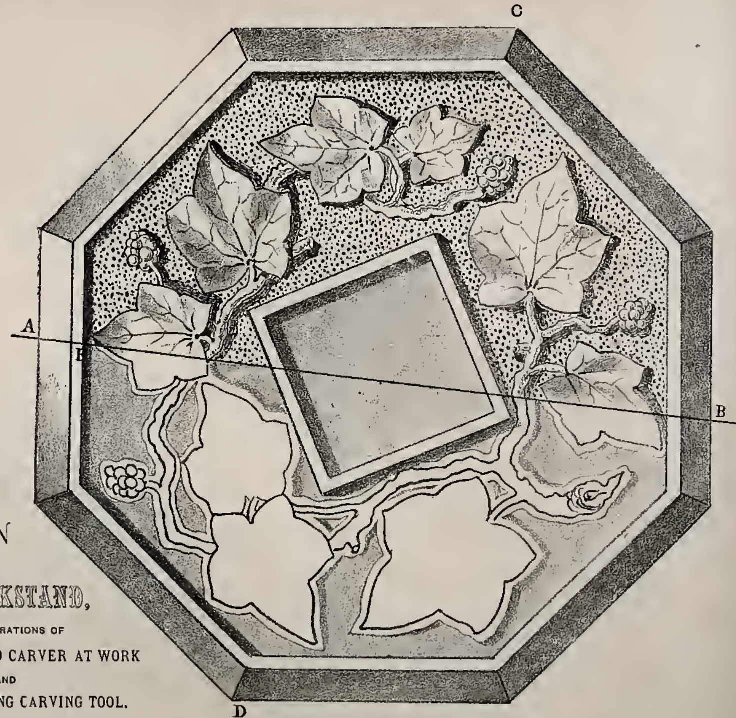


FIG. 7.—DESIGN FOR INKSTAND.—IVY LEAVES AND BERRIES.
The portion below A B shows the design blocked out; the portion above shows appearance of work when finished.

FIG. 8.—SECTION OF INKSTAND ALONG THE LINE A B IN FIG. 7.

WARD, LOCK, & Co., Warwick House, Salisbury Square, London, E.C.

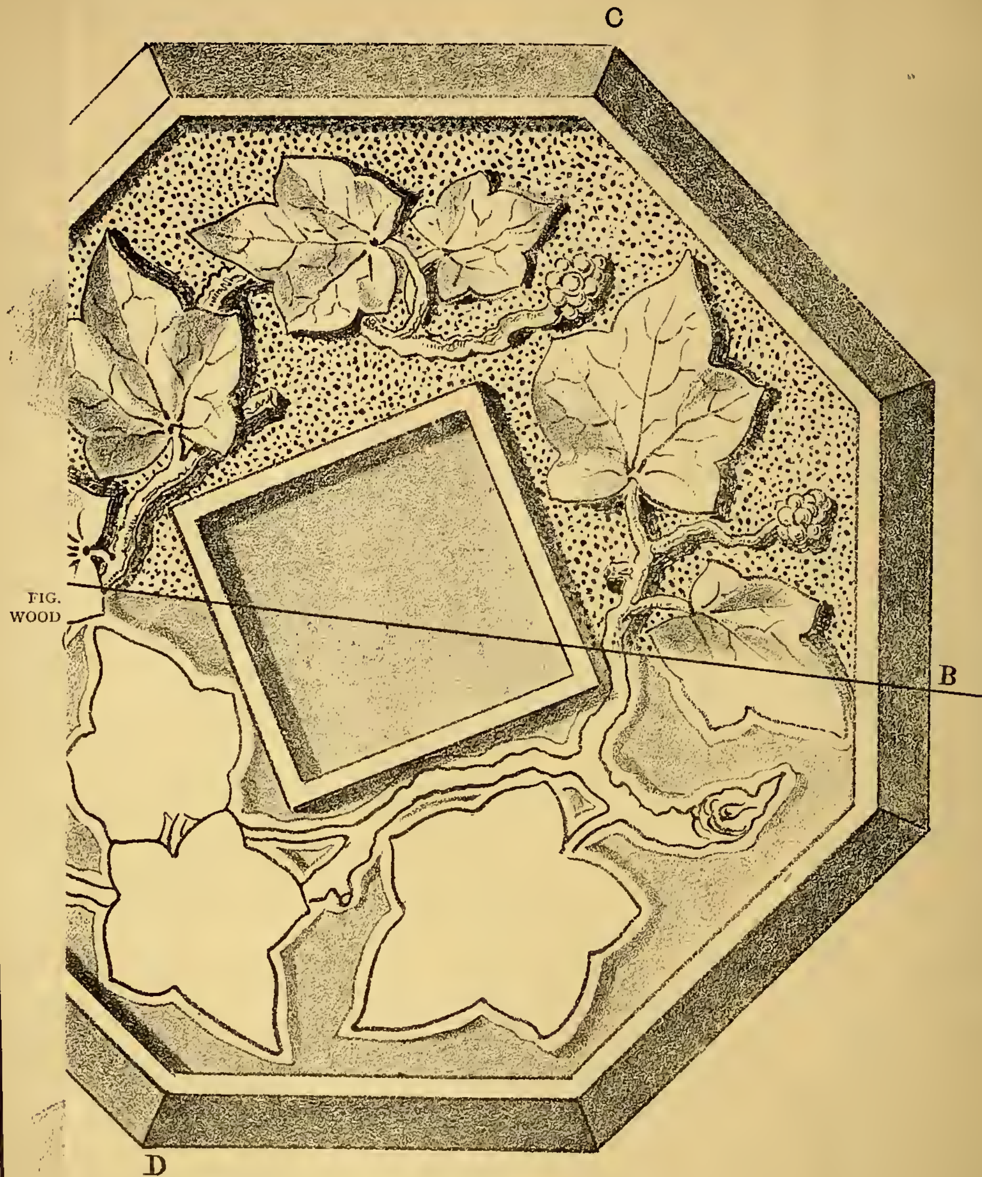


FIG. 7.—DESIGN FOR INKSTAND.—IVY LEAVES AND BERRIES.
portion below A B shows the design blocked out; the portion above shows appearance of work when finished.

FIG. 8.—SECTION OF INKSTAND ALONG THE LINE A B IN FIG. 7.

A VERTICAL DRILL FOR AMATEURS.

By F. J. DURRANCE.

ONE of the most important operations in amateur mechanics is the process of drilling. It is scarcely possible to make any kind of machine or piece of apparatus which does not require the drilling of holes, for the uniting of the various parts together or for may be wanted with equal success. I have shown four different kinds or methods, the last of which (Fig. 4) is the most simple, and within the reach of the "very" amateur, but is nevertheless one of the most useful things to carry about a man can have for odd repairs, or even to keep in the workshop. Fig. 1 is the best, or Fig. 3, which is almost like the ones found in most repair shops. Figs. 2, 3, and 4 can be made by any ordinary blacksmith. Fig. 1 will require the services of the pattern-maker and founder. The

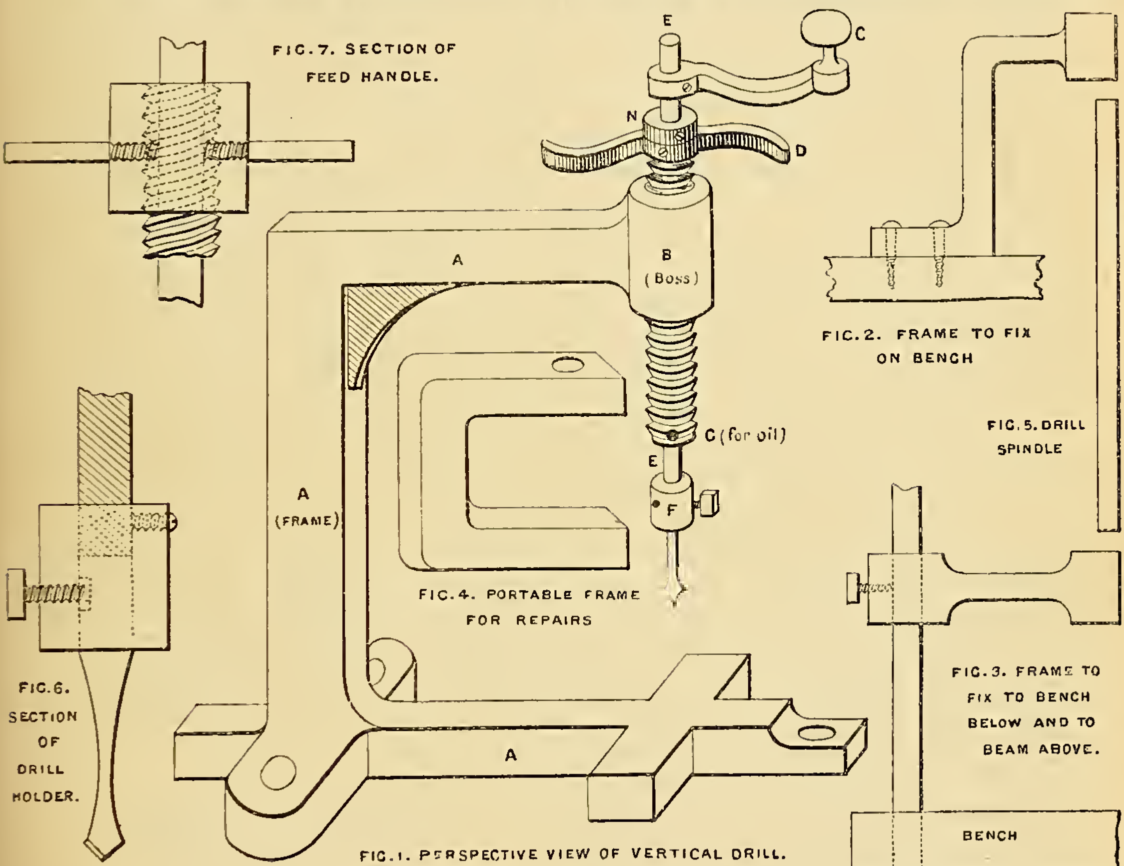


FIG. 7. SECTION OF FEED HANDLE.

FIG. 2. FRAME TO FIX ON BENCH

FIG. 5. DRILL SPINDLE

FIG. 4. PORTABLE FRAME FOR REPAIRS

FIG. 6. SECTION OF DRILL HOLDER.

FIG. 3. FRAME TO FIX TO BENCH BELOW AND TO BEAM ABOVE.

FIG. 1. PERSPECTIVE VIEW OF VERTICAL DRILL.

the several shafts, etc., to revolve in. There are several kinds of drill in the market—good, bad, and indifferent, according to the price paid for them. Of all kinds, the vertical, with feed motion, is the most perfect, and as a rule the most costly. If the reader will carefully follow the instructions here given, he may become the possessor of a very good machine at a small price. The idea is not altogether a new one, but I claim the extreme simplicity of making. In the first place the drawings are not to any scale or proportion, as the size depends entirely on the class of work for which it is intended, but the best of this method is that it can be applied to any size which pattern is very easy to make, and the hole in the boss can be cored out, or left solid and then bored out either in a lathe or with another vertical drilling machine, which will insure the hole being true with the base. Just a word to the wise: I have found that large shops with one or two hundred men will often do an odd job like this, and do it better and cheaper than a small shop. The best way is to ask to see the foreman of the shop. Don't ask for the foreman of the moulders if you want a hole boring, but of the mechanics or turners.

We will now suppose the casting or wrought iron ortion is obtained. The first thing required is the

drill spindle, Fig. 5, which is simply a piece of straight round iron or (preferably) steel. For drilling holes up to about ½ inch the size would be ¼ inch —a size readily obtainable from any dealer in amateurs' sundries. It is used for piston rods, etc. Next get a piece of iron or brass tube, into which the spindle will fit. If you cannot get one to fit, you can get out of this difficulty by getting a piece of a larger bore than the spindle, then plug each end up with about 1 inch of brass, and bore holes right through to fit the spindle. I should recommend gas-piping as the most readily obtainable, and all gas-fitters have taps and dies to fit the various sizes kept in stock; and the gas-thread being very fine is more suitable for our purpose. The tube must now be screwed its entire length. Any plumber will do this for you. Next a hole must be bored in the boss, B, Fig. 1, and tapped to fit the screwed tube. This must be a very tight fit, so that it can only be turned round with some difficulty. Now as regards the length of each portion, we will suppose the boss, B, to be 3 inches long. The tube ought to be about 6 inches. This will give a vertical feed of 3 inches, enough for any ordinary purpose. The spindle should be about 9 inches long, for reasons which I will now explain. The spindle must be capable of turning round freely, but must not have any vertical motion (except that which it gets from the feed). A handle must now be made, C, in Fig. 1, and bored out to fit spindle, E, then firmly fixed with a set screw or other method. This will prevent the spindle dropping through. The next portion required is the bottom collar or drill holder, F, Fig. 1, of which an enlarged drawing is shown at Fig. 6. This is simply a collar made by boring a hole the size of spindle in a short piece of ½ inch rod iron, 1¼ inch long. The spindle is now cut off so as to allow it to project ½ inch below the screwed tube. The collar or drill holder is next driven on tight *close* up to the tube (the ends of the tube must be perfectly square with its length), and firmly fixed with a set screw as shown. It will then leave a hole in the holder for the drill end, ¾ inch long by ¼ inch wide. Just a word, en passant, about the drills. Get a piece of steel the same size as the spindle. If you want to drill a hole larger than this, the steel has only to be spread out to the size with a hammer, then tempered and sharpened. If you want a hole drilled smaller than ¼ inch, one end can be drawn down to size by a blacksmith, leaving ¾ inch plain to go into the holder. He will draw down the pieces for you, and you can then finish to size required, or he will do it outright for about one penny each. I may say by this method of drilling there is not half the drills broken as in the lathe, as you can so easily feel if there is any sticking, and the drill keeps steady to its work.

A set screw must be put into the bottom half of holder, to secure the drills; and it is advisable to file a small flat on the drill for the end of the screw to bed against. This will prevent the drills turning round, without having to tighten up the screw so hard. The next and main thing required is a method of feeding the drill down to its work. This is accomplished by securing a handle firmly on to the top or bottom part of the screwed tube or feeding arrangement. One method is to have a casting, D, Fig. 1, the boss, N, of which is bored out to fit the screw and tapped, then screwed on until level with the end of tube, and a hole drilled nearly through all, then insert a pin or screw. The tube is then bound to turn with the handle. A simple method is that shown at Fig. 7, in section. This is one of the short screwed portions used by gasfitters to join up two pipes. This is simply put on, and two holes drilled at opposite points, and two short pieces of steel or iron wire driven or screwed in these, making four handles, by which the screw can be turned up or down. I may say Fig. 2 would be a very simple and effective form for screwing down permanently to a bench. Fig. 3 can be also rendered a very effective pattern by having another extra bar, as shown, to slide up or down, so as to get a greater range of work under the drill. I will now conclude, hoping the amateur drill-maker will succeed in his efforts.

Caution.—The handle, C, in Fig. 1, and the drill holder, F, are shown in the drawings as if they were some distance from the ends of the tube. This is, of course, only to show them plainer. In reality they are, as explained, in close contact with the tube, or the spindle would shake up and down. A heavy disc wheel can be used in place of the handle, C. This will help the drill better than the handle, as it will act as a flywheel.

INLAYING IN VENEERS.

By WALTER J. STANFORD.

II.—GOLDEN RULE IN INLAYING—CUTTING TRIANGLES—LAYING ON STRINGING, ETC.—CLEANING OFF AND POLISHING—LEGS AND FRINGE—CHESS TABLE.

BY this time all, I suppose, will have got as far as I went in my last article, that is, to the end of the star, and I hope they are satisfied with their work. I have purposely kept until now a most important item, and that is, the direction of the grain in each piece; and for this reason, because, if you have laid it on wrong, the having to take it off will impress on your memory the importance of the item. The rule is—"The grain in each piece must run to

the centre" (and it is one that must never be broken). If you have one piece wrong, when the table is polished the contrary grain will show badly. The next things to go on are eight squares, each made up of four triangles of grey and mahogany, as will be seen from the engraving. These may be cut on a mitre board, as they are isosceles, right-angled triangles; but the simplest, quickest, and most sure way is to make a "mould" to fit a triangle on the shooting-board, as was done for the other triangles. Glue on each square as you cut it out, cleaning off the waste glue at once. Outside these squares a band of mosaic inlaying or stringing has to run. This may be bought in lengths of any fancy timber merchant. A few were shown in the folding sheet that accompanied the preceding paper, with the prices per yard, as supplied by Messrs. Booth Brothers, of *Stephen Street*, *Dublin*. When I took these samples, their stock was small, and consequently they do not adequately represent the beautiful work often found in stringing; but their prices are low, and they will send samples to choose from, should a better piece be wanted.

The stringing is put on in its place, piece by piece, in somewhat the following manner:—Lay a piece touching the veneer that it is coming against with a straightedge and pencil, mark a line to correspond with the joints of the veneer; do this at both ends, and then on a piece of hard wood, with a sharp chisel, cut right through, a little outside your lines. Glue that piece on, and do the next the same way. It is useless to attempt to plane it, for it will all fall to bits if you try. Outside the stringing runs a strip of Riga oak, all round. In laying this on, be careful of the grain, for, to have it running to the centre, you will have to cut the oak diagonally, as you will see. To make these joints, cut out one, and by it glue on the shooting-board a waste piece at the required angle, and cut them all to it. As each new mould is glued to the shooting-board, the others may be taken off with the hot iron. Outside this runs another strip of the same stringing, which, by-the-by, is not among the samples; but Pattern C may be substituted for it. Now fill in with dyed black (ebony is very little used, on account of its hardness). In laying on these, cut out four first, by a cardboard pattern, just so as to fit the angle, not caring about the joint to be made with the next one, or about the required size. Put these four opposite each other, and when the glue is set, cut the joints with your knife and steel rule, and raise the waste pieces. Cut a pattern of the four remaining pieces, and without regard to the requisite size, glue them on. Now, by measuring either from the centre or edges, put marks at the points that will make the black the right size, and cut the eight pieces off. Round this run a band of different stringing, pattern D will do. Outside this a rim of yacca comes, round outside which runs the same stringing as was put inside.

This done, cut the corners off the board to form the octagon before you put on the walnut. Should your lines have got washed out, they are easily re-formed by taking the corners as centre, and the distance to the entire centre as radius, and describing arcs. Now glue plain walnut round the edges, which should be sized and sand-papered first: these may be stuck on anyhow, the four opposite pieces being put on first, as when the glue is set they can be cut and planed to fit. Now cut out and lay on the walnut to complete the table. In this, as big pieces are concerned, you may always put in straight joints to make up the required size, provided they are good ones: but, if possible, it is always best to put on one complete piece instead of several small pieces. Now, with your marking-gauge mark all round, on the top and sides, for the bevel, as shown. Put four opposite black ones on first; let the glue set, clean them off, and then put on the other four, and your table is complete, as far as the laying on goes.

This part of the work being completed, we now come to the tedious work of cleaning off and polishing. In this part more skill and patience is required than in the laying on, because it is very hard to lay down rules for scraping and polishing, as you can for cutting and planing. However, I will give a few hints about it which I hope will enable you to make at least a fairly good attempt at it. The first thing to be done is to bring all the veneer to the same level, as some is always thicker than others—the black, for instance, than the walnut. This is done with the tooth-plane. Sharpen this as an ordinary plane, and set it fine. Fix your table firmly either by means of a "dog," or else in the bench-vice, and with this plane plane down all the high pieces; be careful not to keep on the same spot too long, as the wood gets heated, and you are liable to make a hole. Take all the pieces in turn, and do it by degrees.

When the surface of the veneered work on the table is fairly level (not necessarily smooth, mind), sharpen up your scraper. It must have a touch first on the grindstone, and then on the oilstone; but it must only be a touch, as the real work is done by the scraper-sharpener. Hold one of its long edges at right angles to the stone, give it a touch all over that edge; do the same to the other long edge. Wipe it, and holding it perpendicularly again on the oilstone, give both edges a few rubs. This is just to start the turning of the cutting edges. Now lay it flat on a board, and give two or three passes on both sides of both edges, up and down, with the scraper-sharpener, keeping the sharpener *perfectly flat* on the scraper. Now stand

it on one of its short edges (Fig. 14), and with a firm hand rub the sharpener up and down a long edge. Let both of your long sides have a dose of this, turning it upside down, so that the bottom may be sharpened as well as the top. In doing this, the sharpener must be perfectly square with the edge, and not allowed to slant. Now lay the scraper flat again, and turn the edges back again by a few rubs on both sides, as you did before. Stand it on its end again, and give two hard, firm passes upon both edges; turn it upside down, and give two more on each, keeping the sharpener square as before. Now let the sharpener have a slight slant, and give two, and only two, passes up, on both edges, as you did just now; and your scraper should have four cutting edges—sharp ones, too—on it. A little practice, and you will very soon understand it. In Fig. 14 the position of the hands is shown in the act of using the sharpener; in Fig. 13 is shown the position the scraper is held in when in use on the table. The handle shown in Fig. 10 is useless, and need never be bought with a scraper.

FIG. 13.—MODE OF HOLDING SCRAPER.

When the scraper is sharpened, holding it somewhat in the position shown, begin to scrape, keeping the table firmly fixed. This is laborious work, and takes a very long time; but do not be satisfied till you get a perfectly smooth and even surface. Never keep scraping in one place, or you will have a hole at once, and constantly change the direction of scraping—sometimes to you, and sometimes from you. Keep the scraper sharp, using all four edges, and don't mind burning your thumbs. When you resharpen the scraper, begin as if you had just taken it off the oilstone, and work as before. The black bevel and walnut edge cannot be scraped, but must be sandpapered down. As it is very difficult to prevent rounding the black, with the cork rubber and sandpaper, I always plane it with a very sharp and finely-set smoothing-plane; but this requires care. When you are perfectly satisfied with the surface you have obtained, give it a good rubbing with No. 1 sandpaper—with a cork rubber, of course; but, remember, you cannot put the scraper on again after the sandpaper, or you will destroy the scraper; so keep the sandpaper to the very last. Now it is ready for French polishing. Many people have given excellent advice and teaching in this art, in AMATEUR WORK. My ideas concur very closely with those of "Punch," who sent an answer to some querist, to "Amateurs in Council," about May or June of last year; but I daresay a few remarks would not be out of place here. Pour a good deal of linseed oil over the surface first, to fill up the pores, rub it in with a piece of cotton wool, let it dry, and now make a large-sized fresh pad of cotton wool, covering the whole with some of its own skin. Procure some best "white French polish," and wet well this pad. Cover this with some worn-out calico, and on the outside put *one* drop of oil Now, with a gentle, circular movement, begin polishing all over the top and edges, taking care not to keep working on one spot. When the rubber feels dry and sticky, refill with polish, and put on another drop of oil. Continue rubbing till you get a rough surface of polish, and then with fine sandpaper rub all off down to the wood, and begin again as before. Work till you get a good surface; that is, till you can see your face clearly in it. You must always polish in a warm atmosphere—near a fire, for instance—or the polish will turn white. When you have got the required surface, put a few drops of methylated spirits into your pad, instead of polish, a mere suspicion of oil for the first filling *only*, on the calico, and work as before. I should have mentioned before, that you must always take a fresh spot on your calico each time you refill the pad, as the other gets greasy. Leave the table for a couple of days for the polish to go down, and then repolish as before and spirit off again. Patience and pains will ensure success.

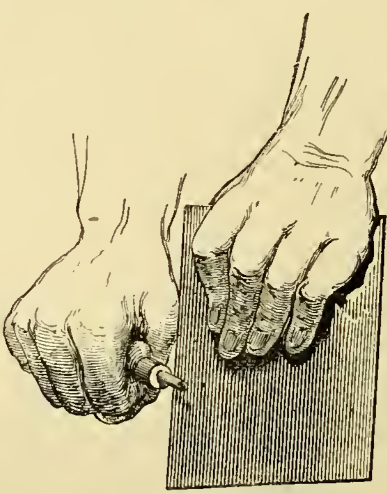


FIG. 14.—MODE OF SHARPENING SCRAPER.

At this stage of the work the table is quite finished, except the legs and the fringe. The legs belong to turners' work, and I content myself with giving a suggestion for them. The legs shown in Fig. 15 are simple to make and very effective; they should

be turned out of walnut, to match the outside wood. For the fringe, lay the table upside down on a cushion. About $\frac{3}{4}$ inch from the edge, all round, glue on pieces 2 inches by $\frac{3}{4}$ inch, any wood, making rough joints to correspond with the angles made by the sides of the octagon. These should not be screwed or nailed on, for fear of their going through or splitting the wood. To these the fringe may be nailed by ornamental pins. It will take about $3\frac{1}{2}$ yards of fringe, and you should put five pins on each side, taking care to have them equidistant. Now the first table is quite finished, and, encouraged by your success with it, I hope you will go on and make the second that I am now going to describe briefly.

The construction of the chess-table, as is evident, is much simpler than that of the former one, but I have given the former one first, for two reasons. I made it first myself, and I also think that it is better practice to take the more complicated one first, because "the harder the whetstone the keener the knife, and when you come to cut wood afterwards it is easy," so with a chess-table after a tea-table. There is a new element introduced into this, and that is the squares and circles; both are absurdly simple, and no one need be afraid of them.

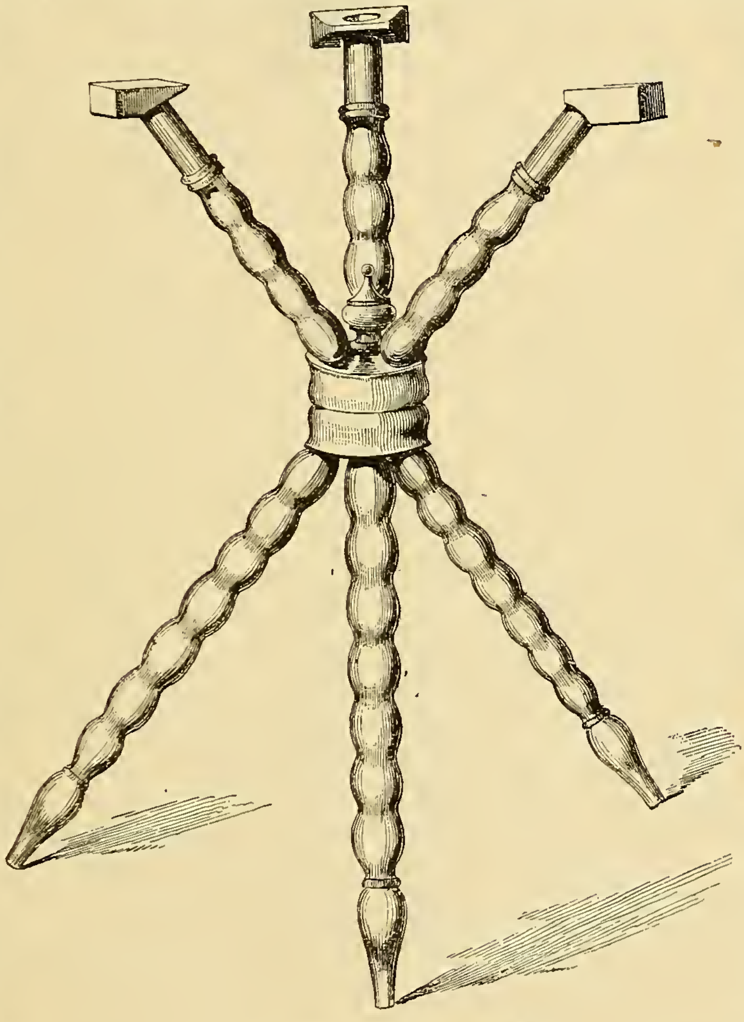


FIG. 15.—DESIGN FOR LEGS OF TABLE.

Prepare your top for the first table, putting the bars on underneath, and drawing a square of about $22\frac{1}{2}$ inches, and diagonal and central lines. Begin by finding out the total length of the square, made by the eight small squares. You will find it just a foot. So draw an inner square of a foot; that is, each line will be 6 inches from the central line. On your shooting-board take any piece of waste veneer, square two edges to each other, and glue it on against the stop, $1\frac{1}{2}$ inch from the edge. Now roughly cut out thirty-two black and thirty-two white with your knife, leaving plenty to spare on each; plane a straight edge on each, and square another to fit the right angle made by the stop, and the piece just glued against it. Plane away as much as you can, and in half an hour you will have them all fitting. Begin to lay on from the centre of your foot square piece, and work outwards. Now glue any small bit of hard wood on the veneer in the centre of the table; find the centre of it by trial from the corners, and make a distinct mark there.

Round the centre, which is formed of black and white squares, you must run stringing — Pattern K is what I used for it. This must not be mitred at the corners, but run out at one end to receive the square of purple that is shown; a careful study of the drawings will show how this is done, and how the joints round the 1 inch square are made. Next cut, and lay on the right-angled triangles of Amboyna, which make it look as if another square had been laid across the first one. Round this I have laid one broad piece of stringing, but three narrow ones will answer as well. If you put Pattern A in the centre, and Pattern N on either

side of it, it will do perfectly. Now fill it with yacca, and here we come to the circles. You must either make or obtain a cutting compass. It is simply a square bar of wood about ½ inch square, or so, with a cutting edge fixed through it at one end. A piece of steel ground to the shape of the cutting-iron of a fillester plane is what is wanted. On the bar one of the heads of the trammel is put, which slides up and down, so as to alter the radius, or holes may be drilled along the bar and a bradawl inserted, for a pivot on which to work the compass. The cheapest way of doing it would be to get the bar and cutting-iron made, and use one of the trammel heads you already have ; but if you like to get the thing complete, Messrs. Booth Brothers will supply one for three shillings. Now cut the yacca to fit the angles, and let it stick out any how ; fix the cutting compass to the necessary radius, hold the centre firmly and cut all round, and take off the waste pieces. Round this run Pattern L stringing. This is put on by gluing a good length, and beginning at one end and laying it, putting tacks outside as you go, it will stick all right.

Outside this runs a circular border of Riga oak. This is put on in small pieces, with the inner edge cut to fit the circle. The compass won't be quite right for this circle, the head will want to be moved slightly back, to allow for the stringing just put on. Have pieces of the oak about 3 or 4 inches long, cut Fix the centre of the compass on any board, and cut an arc out of each piece. Make a straight joint for the next piece to meet it, and so on all round. Then put the compass in the table centre again, and cut the outer circle of the oak. Round this another row of stringing has to go, Pattern L again, and then the walnut is put on in pieces ; straight joints, that is, joints with the grain, being made, except at the corners of the octagon ; but if possible the corners should not be divided, so as to make it appear as if the groundwork was solid walnut. The octagon should have been first cut and the edges sized and covered before the outside walnut was put on. Put the black bevel on, and finish all off as in the other table, taking off the piece of wood in the centre with a chisel and the iron. If you have taken ordinary care and interest in the work the result will exceed your fondest expectations, and if you try to sell the tables, I dare say you would get between three and four pounds for each. A draught-board and backgammon box is made just in the same way, only remember if you try one, *all* the inside must be cleaned off and polished before anything is put together.

Should anyone wish for hints on making a draught-board and backgammon box, I will at any time give with pleasure a few brief suggestions in "Amateurs in Council."

HANDY WORK IN FARM AND GARDEN.

By GEORGE EDWINSON.

II.—STONE HEDGES—COMPOSITE STONE AND TURF HEDGES, ETC., ETC.

WHERE stones abound in the soil of fields or gardens, or on the surface of land about to be reclaimed for cultivation, they should be utilized in building hedges either wholly of stone, or partly of stone and turf. If the stones are large and abundant, the hedges should be built wholly of stone, but the form of the hedge and the method of building it must be determined according to the intended use of the enclosure. Fields destined for arable land alone may be enclosed with stone fences ; but pasture land should be enclosed with banks of soil and stones, planted with bushes to shelter the cattle from storms and from the direct glare of the summer sun. If wood is scarce on the farm, it will be well to make a provision against scarcity by planting the banks with such woods as may be required for useful purposes. If only a few stones are obtainable, or should the stone have to be quarried for the purpose, it will be advisable to build only a part of the hedge with stone, and finish it with turf; but here again the sizes and shapes of the stones must guide our decision. Should the land yield a plentiful supply of heavy boulders, each weighing, say, from half to three or four hundredweight, these should be conveyed to the site of the hedge, to be used in its foundation, and in this case the turfs must be first cut from the site, and piled for future use, the boulders being laid in their places for foundation stones.

Heavy stones may be conveyed on drays or sleighs, these will be found most convenient for the purpose, since all the most ponderous and unwieldly boulders can be rolled on to a sleigh by the aid of a plank and handspike, and drawn by a horse to the hedge ; only light stones should be loaded into carts. We hope to give some illustrated descriptions of drags and sleighs for farm use in an early chapter.

Any and every form and size of stone may be used in building hedges, from the thin slate to the fist-like spar, or the unwieldy flint pebble no larger than a man's hand. But each form and size will require distinct methods in building them up to make a secure fence. Knobby, knubbly, or rubbly stones, as they are termed in various counties, such as flints and spars, can only be used together with turf, or built up into walls with cement ; thin slate-like stones, as large as a man's hand, or still larger, up to two feet in length, may be built up in the form of a dry stone wall in two or three different ways, or they will form excel-

lent facings and foundations for a composite turf and stone hedge.

In the flat method of building stone walls, some of the largest stones are laid flat for foundations on the firmly-beaten or trodden site of the fence, dug some eighteen inches below the surface of the field, or, to put it in another way, a trench 3 feet wide, and 18 inches in depth is first dug for the foundations, the bottom of this trench is trodden or beaten firm, and shaped with a uniform inclination from the sides to the centre, lines are then stretched along between pegs, at equal distances apart, to guide the straight sides of the wall, and the flat foundation stones are laid to those lines, with the straightest side of the stones to the lines. A slight inequality in the ends of the stones where they meet each other, and also slight deviations from the straight line are disregarded, but the stones are made to nearly fit by knocking off a corner here and there with a hedger's hammer (Fig. 14). The inner interstices, or spaces between the two lines of foundation stones, must now be filled up with soil and heaped up in the middle. In laying the next course of stones, the edges are placed about half an inch further in than those of the foundation stones, and soil is drawn forward from the middle of the wall with the hammer, for the purpose of bedding the stones in their places, small rubbish and chippings being laid in the middle of the wall for filling. The next course of stones must be laid still further in, and bedded similar to that of the second, soil being thrown up on the wall for the purpose as the work proceeds. Thus course after course is laid until the wall is knee high, then the courses are built with less slope, until the wall has attained the height of 3 feet; from this height it is built perpendicular to a height of 5 feet, and finished with a projecting coping of slate overhanging 2 inches, surmounted with another course of stone and a rounded mound of turf beaten down firm.

In laying the courses of stone, see that they have a tendency to dip inward toward the centre of the wall, rather than outward; also, select some long stones and lay them at intervals across the wall to form keys for the purpose of binding the two sides. Carry up the wall to a uniformly tasteful bevel, bearing in mind that a perpendicular or plumb dry stone wall will belly whilst sinking, and soon fall. A bevel-sided wall with projecting coping will also deter cattle from attempting to leap the fence. Finally, well beat down the filling of soil, and see that it is made to fill all the space between the stones.

Thin and slatey stones are frequently built with their outer edges placed perpendicularly instead of horizontally, and such fences are most strong and durable. The method of preparing and laying the foundations is much the same as that employed for flat building, but in this last, the foundation stones are placed side by side on their edges, and the interstices are filled with soil. Course upon course is thus laid, the lightest stones being reserved for the upper courses, and long key stones being put in at intervals to bind the hedge well together. As the filling is entirely of soil beaten down hard, the top of the hedge may be planted with bushes, and it should be built similar in width and form to that of a turf hedge. Pillars of flat work at intervals of ten paces, and the two finish courses of small stones laid in herring-bone style, as shown in Fig. 12, will form a picturesque fence, suitable alike for farm or garden. Ends of such hedges near gateways should always be built of substantial flat work, and rounded on each side to meet the gate-posts.

When the coping stones have been laid, and a row of thin turfs have been laid upon them, a most effective cattle-proof fence may be formed by planting two rows of scrubby thorns on the top of the fence in such a manner as to cause them to lean over the coping stones on each side, and present a thicket of thorn overhanging the fence. This fence will bid defiance to ground game and their hunters, for few animals will dare attempt a leap over such a bristling array of thorns. The middle of the hedge must, of course, be filled up with soil and banked above the roots of the thorns as they are planted. In a few years the thorns will shoot up straight through the loose soil and fill the middle of the hedge, and the spaces between the stones may be filled with drooping plants on the garden side.

Very small stones about the size of a man's hand, spar and flint stones of small size, and stone liable to decay when exposed to the atmosphere, are best built up in composite order with turf, that is to say, a thin course of turf should be placed between each course of stones, a few bramble roots should also be laid in with the turf, and the sides of the hedge well bevelled. Rough unshapely stones of small size may be used as a foundation for turf hedges after the manner described in "Every Man His Own Mechanic," p. 521, *i.e.*, a V-shaped trench should be dug and filled with the stones, and then the stones piled up to form a bank; this bank should then be faced with turf backed up with a filling of soil, and thus completed in every way similar to that of a turf hedge.

Kentish rag, sandstone, limestone, granite, and several other sorts of stone which have tolerably straight lines of fracture, and thus break up in quarrying into blocks with one or more faces to them, may be easily built up as dry stone hedges, with soil for a filling, by exercising a little thought in the choice of stones, and matching the various shapes and sizes in building them. In this way stone hedges of coursed work, as shown in Fig. 15, or rubble work, as shown in

Fig. 13, may be raised without the use of mortar, or this may be used if preferred and abundant. Flints and spar stones, and other rubbly stones, may be built up into very strong and durable concrete walls by the following method :—

Prepare a foundation trench from 18 inches to 2 feet in depth, and from 2½ to 3 feet wide, just as may be required by the nature of the soil (earthy and clay soils require a wider and deeper trench than stony soils), and fill this with a mixture of rubble, shingle, and sand, made up into a muddy mass with Portland cement and water. The proportions are, one bushel of cement to one square yard of rubble, etc. First, make up a square heap of the mixture, spread the cement over the top, throw on enough water to make the whole mass muddy as it is being turned over with shovels, keep turning it over until it is well mixed, then throw it at once into the trench, and allow it to set there. When the trench is full, stakes must be driven down on each side of the foundation, and planks fastened to the stakes to form a shell for the wall; this shell must be filled with concrete, and allowed to set, then the shell of planks is lifted higher, and again filled up ; and thus course upon course of concrete is built until the desired height is attained. The planks must be inclined toward each other in laying the first course, so as to bring the wall narrower than at the foundation, and this may be done by inserting wooden wedges between the planks and the stakes, or the stakes themselves may be cut to the desired bevel.

The work of building such a wall is most arduous, since no time may be lost in turning over the heap of rubble whilst the cement is wet, and the quality of the concrete will be enhanced by the employment of two strong men with shovels to turn it as quickly as possible. Some good examples of concrete walls may be met with on and near the south coast of Sussex.

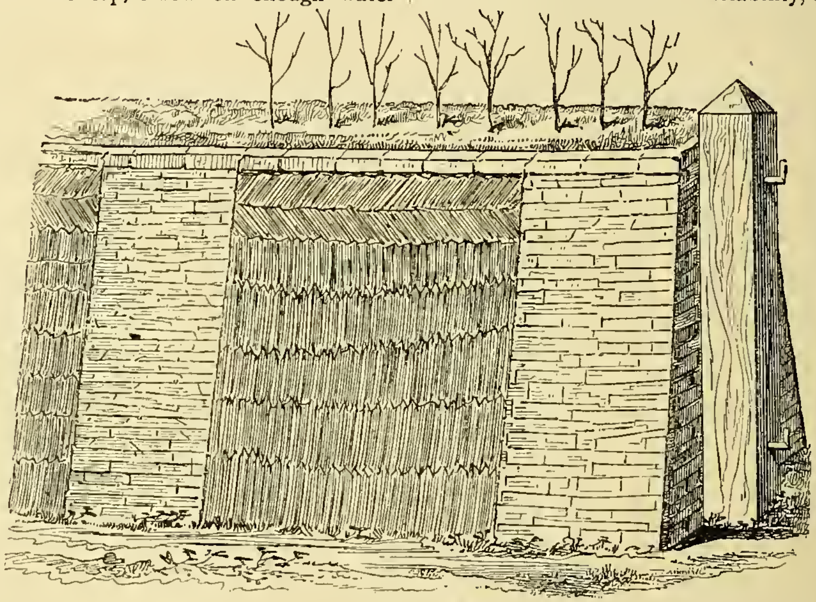


FIG. 12.—DRY STONE HEDGE BUILT IN COMPOSITE FLAT AND VERTICAL COURSED WORK WITH SLATES.

Where forest lands are being cleared, some substantial fences may be erected with stumps and roots of trees, by arranging the heavy stumps in line for the foundation, filling up the spaces between them with smaller stumps and soil, and finishing off with a facing and coping of turf. If the stumps thus put in are green, they will send out shoots through the turf and soon form a bushy hedge, which must be trimmed as a quickset hedge. A serious objection to this form of hedge, and also to one built of turf alone, exists in districts overrun with rabbits, rats, and other burrowing vermin ; these soon burrow between the stumps, and are not easily dislodged from their strongholds. Similar objections may be raised against log fences, with the additional one of instability, as the logs rot down, or are taken out for firewood, and cause a general untidy appearance, not easily put in order again. But log, and stump, and rail fences of a rough nature, will be long regarded as necessities in backwood farming, where wood is an incumbrance. I hope to have an opportunity of giving some attention to rail fences of various kinds in another chapter.

In repairing stone fences, and also in repairing turf, or composite hedges with stones, we must first clear away the debris of the breach, and clear out the loose stones or turf from the gap, the mode of procedure being as follows :—

Loosen the mound of earth and stones with a pick, and take out all stones, throwing them in a heap on the right or left-hand side of the gap, then clear away the earth from the foot of the gap with a spade or shovel, then remove all loose stones from the gap itself, and clear out all loose soil with the mattock end of the hedger's hammer, if only a small gap, or with a mattock, fizgey, or spade, if the gap is large. Next clear away loose stones and soil down to the foundation, and if the foundation stones remain in their places, leave them there to build upon ; but if they

have been removed, clear them out altogether and lay them afresh on a clear firm foundation ; also, clear away stones to right and left of the gap so as to form a secure base, and ensure the new work being properly and firmly jointed with the old work. If the old work has bulged out of bevel, or out of line, do not attempt to follow it with the new work, but carry this up to the right bevel and line inside that of the old work ; but if, on the other hand, the turf has been worn away to a deeper bevel, or the stonework has sunk inward, then the new work will have a line and bevel outside that of the old. It is well, however, to avoid protrusions if possible by the exercise of a little skill, for projecting parts of hedges in cultivated fields are liable to damage from the whipple-trees and spreaders of harness, whilst ploughing near them.

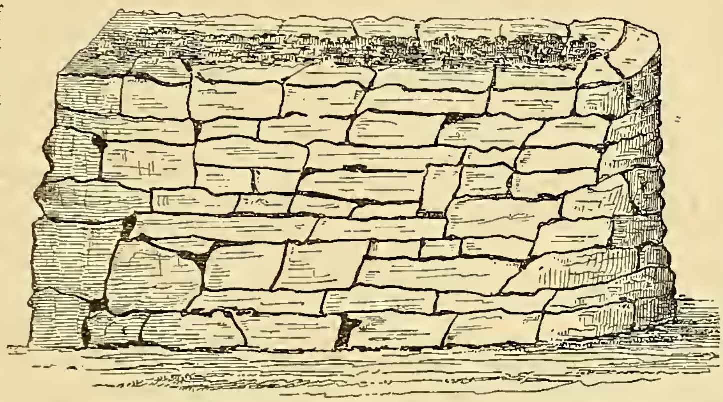


FIG. 13.—DRY STONE WALL BUILT IN RUBBLE WORK WITH KENTISH RAG.

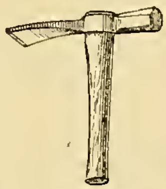


FIG. 14.—HEDGER'S HAMMER.

In building up the new work of a gap, observe the same conditions as those already given for building stone hedges, *i.e.*, let the stones dip inward rather than outward, use the largest stones in the lower courses, build them up in a similar style to those in the rest of the hedge, and put in key stones in every course, and well consolidate the filling of soil. If vertical work in slate, Kentish rag, or other thin stone can be put in, and this work is strongest for mending gaps, the courses can be keyed by wedging small stones between the others at the back of each course. In rubble work, or in composite rubble and turf work, and also in composite coursed work with stones and turf, rough heavy coarse stones should be used in the lower courses, reserving all the light stones for the top courses, with the exception of those that may be required to level the lower courses. In the example given in Fig. 13, a prominent mistake has been purposely made on the left-hand side to show the effect of a departure from this rule. From this it will be seen that a few badly selected and arranged stones will not only spoil the otherwise symmetrical appearance of the face of the hedge, but also give it an insecure effect, no less real than apparent. A few stumpy thorns planted on a newly-mended gap will serve to warn cattle from attempting the familiar pass, and turfed gaps will receive additional protection from a few thorns fastened to the face of the turf by hedge-crooks. In fact, in mending a gap it is better never to neglect this precaution. "Safe bind, safe find," is an old saying that has a sterling ring of truth in it, and, assuredly, the prevention of further damage by adopting it is far less troublesome than to have to clear away the *debris*, and have to do one's work over again from foundation to cap-stone, as it were, owing to a little lack of timely care when bringing the first job to a finish. Cattle have good memories, and if accustomed for a short time to pass from one field to another through any particular gap, they will invariably make for the precise spot on another occasion, and will soon clear a way for themselves if not at once prevented by the means which I have just suggested.

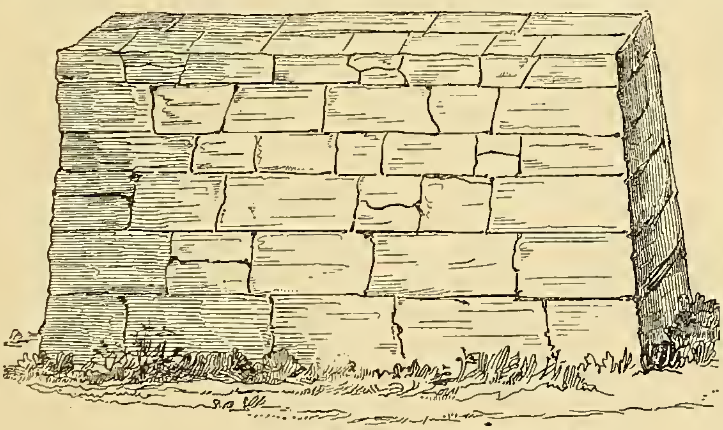


FIG. 15.—EXAMPLE OF COURSED WORK WITH KENTISH RAG.

(*To be continued.*)

OVERGLAZE PAINTING ON PORCELAIN.

By AURELIO DE VEGA.

XII.—MIXTURES (*Concluded*).

210. IN the last paper I gave general indications of the mixing power of the colours in the palette. Those indications, if followed intelligently, will enable much valuable result to be obtained with a minimum of effort. At the same time, in painting, there is a large number of colours very diverse in tint and thoroughly well recognized, which it is well to be able to reproduce in enamel, as although these colours may not be wanted in their standard tint, the method of producing them will show how, if they are composite, a desired modification in the direction of any of their constituents may best be obtained. In the following list, therefore, I give the leading colours in oils with the composition of their enamel equivalent, together with some other colours well known, but, being themselves composite, not regarded as standard. A whole volume might be written on this branch of the subject, but for fine differences of tone the student must rely on his skill and powers of observation.

BLUES.

211. SKY.—Azure, when full, is nearly transparent and of a deep fairly rich hue, but when laid thin, especially with a little added flux, loses its brilliancy and is a pale sky blue, very slightly greyish. A slight *cloudiness* may be imparted to it, not to the extent of destroying the *blueness* by adding a very little shadow for white. In fine evenings there may often be observed in the sky a decided *greenishness*, even to the extent of pale sapphire green. When it is slight a little turquoise may be added, when marked, turquoise alone may not be too strong, or even turquoise with a touch of blue green. When a clearer blue than that of pale azure is required, a pale tone of a mixture of half azure and half outremer is useful. The clearer blues of the sky are generally pale, and fuller than middle tint is rarely requisite, except in Southern skies.

DEEP AZURE is very powerful, and its depth and richness are both increased by the addition of a touch of Royal purple, which imparts a velvety richness and softness most valuable in drapery.

AMETHYST.—Deep azure with a little ruby.

COBALT.—Outremer and deep azure.

CŒRULEUM.—Old tile with a little Dover green.

INDIGO.—Two parts of deep azure to one of tile with a touch of soft black.

LOBELIA.—Azure with a touch of pink.

PRUSSIAN BLUE.—Two parts of outremer to one of turquoise, a little azure for depth and a touch of roseleaf.

ULTRA ASH.—Old tile with a touch of blue green.

ULTRAMARINE.—Deep azure with a touch of purple.

ÆSTHETIC BLUES are some of them very beautiful, and these are always more or less in vogue. They are rather more complicated. Thus a broken blue with a distinct greenish hue for some time very fashionable, could be simulated by azure with a little roseleaf and a touch of golden brown, while a fuller shade in which the blue largely predominated was reproducible by azure with a very little roseleaf and just sufficient—but little more than a touch of—purple to give the requisite brokenness. The same base, with a little carmine instead of purple and a touch of yellow, will give a good peacock blue. An excellent shadow for most of these blues is made from azure as a base, a little Dover or emerald, and violet or purple and a touch of yellow. The last named may only be in minute quantity or the colour will be dirty instead of obscure.

PURPLES AND VIOLETS.

212. Pure purples and violets will result from the mixture of azure or outremer with a gold red, *i.e.*, carmine or rose. Purple and violet—also gold colours—are capable of indefinite modification by the same colours. As violet will arise from mixture between azure and carmine, and rose is but little different from carmine, nearly all the purples and violets may be made from the other four colours named. With pink the result is slightly broken, and with tile rather more so, and purples into which these enter or which are composed from them, are very suitable for distant effects.

AMARANTH.—Carmine, a little purple; if requisite, a touch of azure for depth.

GRAPES, PLUMS.—For the local tint a rather full mixture of azure and carmine or azure and purple; for the darkest shades a touch of grey black in addition; for reflected lights and some lighter local tones, purple with a little azure. With experience a very little roseleaf may be substituted for grey black in shadow. The effect is finer but more risky in obtainment.

HELIOTROPE.—Azure with a little carmine. Lay pale.

MAGENTA.—Royal purple sufficiently blued with outremer.

MARONE.—Royal purple with a touch of vandyk.

MAUVE is well represented by the colour in the palette.

PANSY.—Purple and azure. The rich and varied tones of this flower may all be obtained between deep azure, or azure, purple and mauve.

PEACH BLOOM (Pale).—Pink touched with outremer and laid thin.

PEACH BLOOM (Deeper).—Carmine touched with tile.

PRUNE.—Purple with a very little roseleaf.

VIOLET.—For the standard colour of the flower add a little azure to the palette colour.

CARMINES.

213. Carmine—as Mr. Hancock justly claims—cannot be improved in its own tone by mixture. It is a lovely very bright crimson. Rose is not dissimilar, but in a pale tint is the least degree bluish. Carmine should not be used in a thick coat except for effect, as then it browns slightly. A somewhat hot fire has an effect upon rose, which it is perhaps best to experience. Pink is useful in mixtures which are somewhat less pure than those with carmine, while flesh and salmon are less generally available. These, however, possess the great advantage of bloom.

These colours are all very sensitive to mixture, and a very little of another effects them.

GERANIUM PINK.—If a little amber is added to pink and the two intimately ground up, a very fine bright pink results, which is an excellent local tint for all pink flowers.

LAKE, SCARLET.—Carmine with a touch of light yellow.

LAKE, CRIMSON.—Carmine, full but not too thick.

LAKE, INDIAN.—Purple lake with a little chestnut.

LAKE, PURPLE.—Carmine, a touch of purple.

ROSE MADDER.—Rose with a very little pink.

SALMON.—Salmon with a little carmine.

REDS.

214. Red laid thin is not at all a bad flesh for many complexions and for touching up translucent parts, such as lobes of ears, points of nostrils and between the fingers. In such a case the yellow used must be jaune d'ivoire.

APPLE RED is a very characteristic colour, and may be made between Brunswick and jaune d'ivoire. This colour laid somewhat pale is a good flame colour.

POPPY RED is a difficult one. Red alone is often used, but a much nearer and finer effect may be got by the addition of Royal purple. The mixture requires great care and is a just possible one.

GERANIUM SCARLET is made on paper and canvas with scarlet vermilion; but the vermilions generally have no exact counterpart in enamel colours, the nearest is scarlet which is rather a paladium scarlet, and by the side of the vermilion is ochrey. Hence the scarlet may be made to appear purer by placing a deep orange or amber in juxtaposition.

LIGHT RED.—Red with a slight touch of Brunswick.

VENETIAN RED.—Brunswick with a little jaune d'ivoire.

INDIAN RED.—Brunswick with a little chocolate.

BROWN RED.—Chocolate, otherwise purple brown.

PALADIUM RED.—Red with a little jaune d'ivoire.

The last mentioned shows an approach to orange in its paler shades. Any degree of brownness of a purplish quality, may be obtained by mixture between red Brunswick and chocolate. The brownness of chestnut is rather of a golden quality and this may be imparted to red in a limited degree.

215. I find that in the paragraph on additional colours I omitted to mention a red—Pompadour Red, which is an iron red a trifle purplish. It is obtainable at Messrs. Mortlock's in *Oxford Street*, and is most useful in heightening the colour for cheeks, lips, etc.

ORANGE.

216. Orange is producible by mixture between the yellows and carmine, and the tints so obtained are better than those of the palette, which are really ochres. Amber must be excluded from this note. It is a very rich and pure yellow, reddish in the depth, approaching the orange hue of cadmium, but it is not to be mixed with carmine. In sunsets it is invaluable, and must then be used pure. As before mentioned, red must not be used with Hancock's yellows, but some good colours may be had between it and red-browns and jaune d'ivoire.

SCARLET makes a fair bright orange. It may be washed with a red-brown for shadow or with a grey made from azure touched with red.

CADMIUM ORANGE.—Berlin orange (water) middle tint.

CHROME ORANGE.—Hancock's ivory and red.

ORPIMENT.—Carmine, pale, washed with deep orange.

The following types of orange, in oil and water, are rather reds with an orange tone in the lights.

RUBENS' MADDER.—Red and a little chestnut.

CHINESE ORANGE.—Red, a little Brunswick and chestnut.

MARS ORANGE.—Brunswick and chestnut.

YELLOWS.

217. The yellows of the palette give good variety as to colour; but as their mixing strength is generally high, the jaune d'ivoire has been introduced for iron-red and red-browns. The amber too of Emery is not equalled in the palette, nor, indeed, for strength and purity by mixture. The amber is not a generally mixing yellow, and it works much better on porcelain than on earthenware.

AUREOLIN.—Persian and golden brown.

BUTTERCUP.—Amber, middle tint.

CADMIUM, PALE.—Berlin yellow.

CADMIUM, MIDDLE.—Amber.

CADMIUM, DEEP.—Amber, glazed pale vandyk.

CHROME, PALE. — Persian full, touched with Berlin.

CHROME, MIDDLE.—The same with a touch of vandyk.

CHROME, DEEP.—Light yellow full, and vandyk.

GAMBOGE.—Strong yellow in ordinary. If requisite strengthen with Berlin yellow.

GOLDEN YELLOW.—Full amber, glazed pale golden brown.

INDIAN YELLOW. — Berlin yellow and Berlin orange, glazed delicately with chestnut.

ITALIAN OCHRE.—Pale orange and chestnut.

ITALIAN PINK.—Light yellow and chestnut.

LEMON YELLOW.—Persian.

NAPLES YELLOW.—Hancock's ivory middle tint.

NAPLES, DEEP.—The same with a touch of German brown.

PRIMROSE.—Light yellow pale.

STRONTIAN YELLOW.—Persian with the faintest touch of Sèvres.

YELLOW LAKE.—Light yellow full, glazed delicately for strength with golden brown

YELLOW OCHRE.—Deep orange.

GREENS.

218. The brightest full green of Hancock's palette is Dover. All the others are more or less blue in tone. The Sèvres is rather an apple green ; while the blue-green of this palette is rather a turquoise.

It cannot be too strongly impressed upon the student that pure greens are not to be sought in mixtures. At the same time his consolation is that pure greens are seldom required. When they are, palette greens must be employed.

VERONESE GREEN.—Dover and Gordon.

TERRA VERT.—Deep green (moist water-colour).

MALACHITE.—Sèvres, a little light yellow, and a touch of tile.

VERDIGRIS.—Dover, a little Sèvres.

CHROME GREEN.—Roseleaf and light orange, about one to three.

CHROME DEEP.—Roseleaf and Dover, with a little dark green.

OLIVE.—There are various shades of this as the yellow, green, or brown constituent prevails. Sèvres, with a little light orange, and a dash of roseleaf, gives a good pale olive. A little more roseleaf, and the substitution of golden brown for the light orange, gives a good full olive. Other varieties may be had with deep orange, or with a touch of deep green.

APPLE.—Sèvres and light yellow, with a touch of roseleaf. A good shadow for this and for olive may be made by slight additions of German, though preferably golden, brown.

GRAPE. — For the greener tones, Sèvres just touched with black. (N.B. The incorporation must be perfect.) For the yellower tones, light yellow or light orange added. For the tone of incipient decay, a pale tone of olive shadow.

BROWNS.

219. The browns of the palette are very useful, mixing as they do (except Brunswick and chocolate) with so many of the other colours. Scarlet is a difficult mixer, and for burnt sienna as recommended, trials should first be made on a tile or old plate to get the exact proportions. The browns in oils are very numerous, but many bear so great a family likeness that the following types will prove generally sufficient.

BITUMEN.—Chestnut and German, with a touch of sepia.

BROWN PINK.—Light yellow, chestnut, and a little German.

BURNT SIENNA.—Scarlet, with a little red and a touch of chocolate.

BURNT UMBER.—Vandyk and sepia.

INDIAN BROWN.—Red and sepia.

MADDER BROWN.—Carmine and vandyk.

RAW UMBER.—German brown and a little Berlin orange.

SEPIA.—Sepia.

SEPIA, WARM.—Sepia, with a little carmine.

VANDYK.—Three vandyk, one German, a touch of sepia.

VERONA BROWN.—Yellow, and a little sepia.

GREYS.

220. These are innumerable. Any combination of secondary tints, or of a secondary tint with a primary tint, produces a grey; while in ceramics many very useful and beautiful greys appear when a thin coat is laid of even two primary colours. Moreover as, in ceramics, many pigments are primary, of which the tints are secondary, *e.g.*, purple and green, and greys in great variety are producible, some from such pigments, and others from similar tints produced by composition.

A large number of greys of pronounced leaning towards a definite tint, will be got from a thin coat of many of the colours noted in the preceding sections. Thus a good purple haze arises simply from azure and carmine laid thin, while purple in less quantity than the carmine produces a variation with even more pronounced greyness.

GREEN GREYS.—Tile and yellow, or outremer and amber.

BLUE GREYS have tile for a base. Storm cloud would result from full tile, with a touch of grey black.

DOVE COLOUR.—Pearl grey, with a touch of carmine.

SLATE.—Pearl, with a touch of purple and grey black

Smoke.—Pale grey black.

Pearl.—Pearl, even pale, is rather blue. A better shade is shadow for white with a little pearl.

Drab.—German brown with a little yellow laid thin.

221. Identification of Tints.—The student has now before him a long—indeed, so far as I know, an unprecedentedly long—list of composite colours ; and for their identification I would advise the purchase of one of Reeves', or preferably, Rowney's, specimen sheets of colours, which may be obtained at a very slight expenditure. On the latter, the oil-colours are laid on, and their gloss gives them for ceramic painters an advantage over water or chromo reproductions. They might be cut out, sorted, and pasted in a book, and the ceramic equivalent of each written underneath. By this means a complete and graduated set of colours would be obtained. The constituents given will indicate the best mixtures, and variations in quantity will give corresponding differences of tone.

In the next paper I shall deal with landscape—sky and water.

PRACTICAL SCENE PAINTING FOR AMATEURS.

By HENRY L. BENWELL.

I.—INTRODUCTION—SCENE PAINTING AS AN ART—HISTORICAL NOTES AND REMARKS.

SCENE PAINTING is an art which, until a very recent date, was entirely unknown in this country. In Shakespeare's lifetime the decoration of the stage consisted merely of green or red baize draperies, to which were fixed cards, on which were named the places where the plot of the play was supposed to be laid, such as "This is Hamlet's Palace," and so on. I intend in these columns to give a full description of the process used in the Scenic Art, and will endeavour to make my remarks as concise and practical as possible, avoiding or explaining all technical terms. The present chapters will treat of scene painting, pure and simple, together with the requisite instructions for making the woodwork for the proscenium and the interior scenery. I shall also explain at an early opportunity how to stretch the canvas on the frames. Although these last operations should come under the head of stage carpentry, they will be given here in a simple form, so that the amateur, if he chooses, can commence a little painting at once, and so follow us as we proceed. He will thus have plenty of time for practice, and by the time the difficult part of the art is reached he will, no doubt, have fairly got his hand in.

Should these papers prove as interesting to my readers as I believe they will be, and meet with the success I anticipate, the present series will be followed—with the Editor's permission—by further articles in which I shall introduce the reader to all the arts and mysteries of stage craft, including, amongst other subjects, property making, and mechanical scenery and effects. I shall also give many novel hints and suggestions of great practical value with regard to dramatic furniture and upholstery appliances, and which have never before been published. Possessed of all this information, any amateur artist and carpenter combined can easily construct and erect his portable theatre, and to suit his own taste and pocket. Amateur actors have of late become so ambitious that scenery has now become an essential element in all private theatrical undertakings. Amateurs of to-day are not content unless they present to their admiring friends plays of the most elaborate description, and which would at any time severely tax the resources of an ordinary provincial theatre. As it is difficult and extremely expensive, especially in the country, to hire scenery worth having, whilst in Ireland, India, and the rest of our dependencies, it cannot be had at all, the only resource that is left to the amateur in those climes is to paint his own scenery to the best of his ability and skill.

Private theatricals, we all know, are just now the rage, and are getting more popular as a means of amusement in country districts every season. It is the principal amusement amongst Her Majesty's officers, both naval and military, at home and abroad, whilst every barrack and several of the troopships owns its private theatre. At all our large public schools and colleges, too, we find theatricals very much in vogue. Schoolboys like nothing better than to show off a little histrionic ability before going home for their Christmas vacation. I myself have seen some very clever scenes painted in the schoolroom, mostly by masters, it is true. It was, however, whilst still a schoolboy that I made my first attempt in what I have always thought a most fascinating art, and I remember my success surpassed my most sanguine expectations. At Cambridge we have the A. D. C., and at Oxford the "Philothespians." Both these Societies pay a very large sum for hire of scenery and dresses whenever they act. For instance, the latter club paid a London firm over seventy pounds for the above item when they recently produced "The Merchant of Venice.' I mention these facts to give the reader some idea of the expense this sort of amusement runs into, and also because the principal object we have in view is to enable the amateur to avoid all these expenses by showing him how to do it all for himself, and also to thereby add to his own amusement in no small degree.

As regards the costume department, we hope, when the scenery and stage building portion of these papers are completed, to write a few articles on the making of theatrical dresses, stage boots and sandals, hats and armour. All the above can be made very cheaply at home. I think I have said enough to prove that instructions in the art of scene painting and its accessories have long been in request, and as no reliable work, treating the subject from a practical point of view, has as yet been published, I feel sure the present series of papers will prove to the general reader, interesting, and to the practical man, attractive and useful. I felt for some time a great reluctance to take these papers in hand, wishing to see a more able pen than mine come to the front. It seems, however, that the scenic artists we possess are either not literary men, or that they have not the time nor inclination to discourse on a profession which seems to me to be very jealously guarded.

Having commenced my task, however, I will endeavour to carry it through with satisfaction to one and all, and for this purpose neither my time nor trouble will be stinted, whilst the text will be illustrated as far as the limits of this journal will permit.

Scene Painting as an Art.—Scene painting is an exclusive art, or more plainly speaking, an art by itself. There is no other art just like it, either in the variety of subjects embraced, or in the methods employed to produce the different effects.

The professional scenic artist must be equally at home in landscape and seascape, classical architectural and mechanical drawing, as he frequently has to give faithful pictures now-a-days of most difficult subjects, such as the decks of large ships, interiors of railway stations, etc., with all the moving and mechanical effects, so that a knowledge of all styles of architecture is most essential. He must also be able to pourtray at any time the mountains of sunny Switzerland or the flat lowlands of Holland, the green lanes of old England or the winding valleys of bonny Spain, also the rugged scenery of "ould" Ireland, or a view from some tropical clime; in fact, every known style of architecture, we repeat, must be at his command—the Gothic, the Romanesque, the Greek, the Oriental, etc., etc., for to-day he may be called upon to paint a Moorish temple, and to-morrow the Charing Cross Grand Hotel. His art knows no bounds, his limits cannot be confined. The universe, in fact, must at all times be at his command, and what he cannot see he must imagine, and correctly too. Again, the scene painter is not confined to colours alone in producing his effects, for in fairy and pantomime scenes he makes free use of gold, silver, and coloured foils, bronze powders, and other preparations, which will all be duly mentioned later on. A paper called *The Decorator*, now defunct, once had an article on this art, which ran as follows :—" This peculiar department of the art of painting, as contradistinguished from all others, possesses its own laws, its own practice, and its scientific rules in the same manner as perspective. The scene painter, in the first instance, should be thoroughly conversant with the laws of colours, as it is only by that means that he can judge accurately of the appearance the colours he paints by day will have when subjected to an intense artificial light. In the next place, it is indispensable that he be well versed in the rules of both linear and aërial perspective. He traces by fixed geometrical operations, lines blended or inclined, which the spectator at the proper point of view imagines to be straight ones." " He uses chiefly water colours, on account of their operating promptly and presenting no glossy surface."

The above description gives the reader a very fair idea of the Scenic Art, and for that reason it is reproduced here. To continue our remarks. There are two descriptions of lights to be considered in scene painting—one the light which the painter supposes to illuminate his picture, and the other that which actually does light up the canvas, such as head, foot and side lights ; and the position and power of these must be carefully studied by the artist before he begins work.

Mr. Henry J. Dakin, in his little work, " The Stage in the Drawing Room ; or, The Theatre at Home," thus discourses on the art. Speaking of theatricals in general, he says—"This kind of home amusement and instruction is now becoming very general, and, being a fruitful source of pleasure both to performers and audience, like everything else which is worth doing at all, is worth doing well and of considerable pains being taken to have it done well." Coming to the scenic department, he goes on to say—" Given the fact that there are one or more members of the company who have a knowledge of drawing and painting, the scenic arrangements are by no means the least entertaining and useful of the many interesting occupations in the production of home plays. Here is an opportunity for many a ramble, sketch book in hand, during the summer, to obtain subjects for the out-door scenes, for the powers of observation in noting effective interiors, and in a general way perfecting the study in artistic matters."

I trust that all would-be scene painters will take the above well-chosen words and advice to heart. In doing so, I feel sure they will find the road to fame more easy to accomplish, and that high standard of perfection attained which a thorough amateur, in this or any other art, alone delights in. As a guide to the amateur in colouring his scenes, we quote the following extract from Eckerman's conversations with Goëthe ; it runs thus :—

"Generally the scenes should have a tone favourable to every colour of the dress, like Benther's scenery, which has more or less of a brownish tinge in it, and brings out the colour of the dresses with perfect freshness. If, however, the scene painter is obliged to depart from so favourable an undecided tone, and to represent a red or yellow chamber, a white tent, or a green garden, the actors should be clever enough to avoid similar colours in their dresses. If an actor in a red uniform enters a red room, the upper part of his body vanishes, and only his legs are seen; if with the same dress he enters a green garden, his legs vanish, and the upper part of his body is conspicuous. Thus, I saw an actor in a white uniform and dark breeches, the upper part of whose body completely vanished in a white tent, while the legs disappeared against a dark background. Even when the scene painter is obliged to have a red or yellow chamber, or a green garden or wood, these colours should be somewhat faint and hazy, that every dress in the foreground may be relieved and have the proper effect."

Of course, if the painter be a true artist, he will understand how to make all he does effective, and much must necessarily be left to his taste and judgment; he must, however, remember to paint broadly, neither throwing away his time nor his effect by being too minute in his details. At the same time he must not mistake vacuity for breadth, nor paint too roughly. Let him use good masses of colour, and always remember that his work is to be seen through the medium of an intense yellow ray, excepting, of course, where electricity is used as a means of lighting, in which case all work would require more careful handling and plenty of experience. As the painter progresses with his work, he should frequently retire back some distance and look at the picture from an audience point of view; he will thus be able to see whether he is painting too harshly or on too minute a scale.

Instead of beginning with dead colouring, and then gradually working up his picture, the scene painter puts in all his effects at once—as in fresco painting—the full tone of his lights and shadows, finishing as he proceeds, and merely retouching or glazing those parts afterwards which require additional depth or brilliancy. In scene painting, bravura of execution and strikingness of effect are indispensable, and nature must be rather exaggerated than the contrary; at the same time care must be taken lest mere gaudiness be substituted for brilliancy and richness. Further, as much of the costume of the piece depends upon him, it is important that the scene painter should not only be skilled in architectural delineation, but also well informed as to the styles of different countries and periods, so as to avoid those errors and anachronisms which are frequently committed even by professionals, and which are sometimes so glaring that no beauty of execution can atone for them.

Harmony is the great thing to be considered in this art, for without it nothing can go right, and all things will seem at variance with each other. The scene painter has to contend with many difficulties peculiar to his confined walk of art. The necessity of giving a brilliant light to the auditorium is often destructive to the truth and delicacy of those tints which the artist applies to his scene; while, in addition, the perspective is frequently contradicted and violated by the actor moving about at the very back of the stage, when all those objects placed there, which, whilst the performer remained in front (where everything is in unison with his natural size), appeared in due proportion, lose their verisimilitude, and appear insignificant and disproportioned. The man becomes the same height as the rock or tree, and the imagination of the spectator has insufficient power to preserve the illusion of the scene.

The latter disadvantage, which can scarcely be obviated, the artist would do well, nevertheless, to remember and to modify as much as possible; and the actor also, if he be desirous of rendering the representation a perfect one, will remain as little as possible at the back of the scene. To the scene painter the use of brilliant colours, of skilful chiaroscuro, and of striking management of masses of light and shade, is important. He addresses less the heart and understanding than the eye. With him striking effects are everything. His fame as well as his work is commonly of short duration; and there is consequently the greater reason that he should acquire that promptness and decision of style which would secure immediate approbation. For a performance of this description to be eminently successful, it is requisite that the colours should be clean, bright, fresh, and striking in effect, and that it should be also appropriate to the period in which the play it has been executed for is placed, in order that it may be in accordance with the costume, style, taste, manners and usages of the people to which the scene belongs. Mr. M. E. James, in his work called "What Shall We Act?" refers thusly to scene painting:—"The method of putting on the colours in distemper differs from oil and water-colour painting. In the latter, one usually lays in large flat washes, gradually working in the darker and stronger colours; in oils, the darker tones make the groundwork, and they are brightened up by degrees, *but in distemper the whole process should be as nearly as possible completed in the first intention.*" The italics are mine.

I trust I have now given my readers a good general idea of distemper painting as applied to the Scenic

Art, and hope my readers will be able to follow me all the better when I come to the more practical and instructive part of my work. I also trust that the information I am about to impart in future papers will prove as useful to ladies as I hope they will be acceptable to gentlemen. I am led to think of the ladies for this reason. It frequently happens in small country towns and villages that there is a great need of funds for some local charity, and to raise the necessary money in these cases the ladies of the town or parish generally set to work and organize some sort of bazaar or fancy fair; in these cases there is generally a health or dress, as the materials employed in distemper and fresco painting are perfectly harmless and devoid of all obnoxious odours. All that is required is an old cotton dress, and this will wash quite clean when the work is all finished. I trust, therefore, that even ladies, after following the lessons I intend to give in this art, will no longer experience any difficulty in carrying out all their plans, but that their labours will be attended, not only with pleasure and advantage to themselves, but with profit to those in whose aid an English woman loves so graciously to labour for—the poor and needy.

FIG. I.—SCENE FROM "PRINCE DORUS, OR THE ROMANCE OF THE NOSE." FROM THE "ILLUSTRATED LONDON NEWS," CHRISTMAS, 1851.

desire by those in authority to decorate the hall or room in which the bazaar is to be held. All such attempts, however, that I have come across in the provinces, have been more or less failures; and in most cases the whole thing, as far as the decorating portion was concerned, would have been better left alone. Now, I have not the least doubt but that the ladies possess the requisite amount of artistic ability to accomplish all these decorating matters, but for the want of perfect knowledge of painting in distemper—in which most decorations of this kind are painted—they are unable to bring to a successful issue what would otherwise have been a most agreeable task. And besides, they need not fear any injury to their

Desiring to make this series of articles as complete in themselves as it lies in my power to do so, I shall conclude the present chapter with a few collected Notes and Historical Remarks on this interesting art, for which I am mostly indebted to Mr. Lancaster.

Historical Notes and Remarks.—It may not be generally known that the Italians were the first who really looked upon the decoration of the stage as an art. Such it was, however, and all the principal scenery in this country was for a considerable period painted mostly by Italian artists, till at last, in the height of the drama's glory, when new plays were abundant and ever forthcoming, and every other actor

a "star," there came to the front Sir William Davenant, who was the first English scene painter of any note. The great architect, Inigo Jones, was also one of the first theatrical decorators in England. The Puritans' reign proved ruinous to the theatres; but with the Restoration they were restored to their former prosperity and honour. At this time a new play-house was built in Vere Street, Clare Market; and it was in old Drury Lane Theatre that scenery was for the first time regularly made use of. Sir William had, however, some little time before, introduced the first scenes ever acted before, at his private theatre in Dorset Gardens, near the Temple. These were painted by Italian artists, then engaged as scenic painters at the principal theatre in Paris. These Italians were afterwards rivalled by a very clever painter, Monsieur Devoto, a Frenchman, who was brought to this country by the famous Rich, whose son John afterwards introduced the first English pantomime, in which clown and harlequin were one personage. Devoto painted the scenery and decoration for the new theatre built by Rich in Goodman's Fields, memorable as that wherein Garrick, in the year 1745, made his name so great and his fame so wide. When Handel and Bononcini composed the music for the opera in the early part of the eighteenth century, and the rival goddesses, Faustina and Cuzzoni, waged their great war of "Tweedledum and Tweedledee," which divided the musical world into two bitterly antagonistic parties, Signor Amiconi contributed his tasteful talents to the production of the scenery. He came to England in the same vessel as his friends Farinelli and Bononcini, travelled to London with them in the same carriage, and by their aid obtained the appointment of principal scene painter at the opera house. He afterwards painted at Covent Garden in conjunction with the celebrated George Lambert, so well known as the founder of the

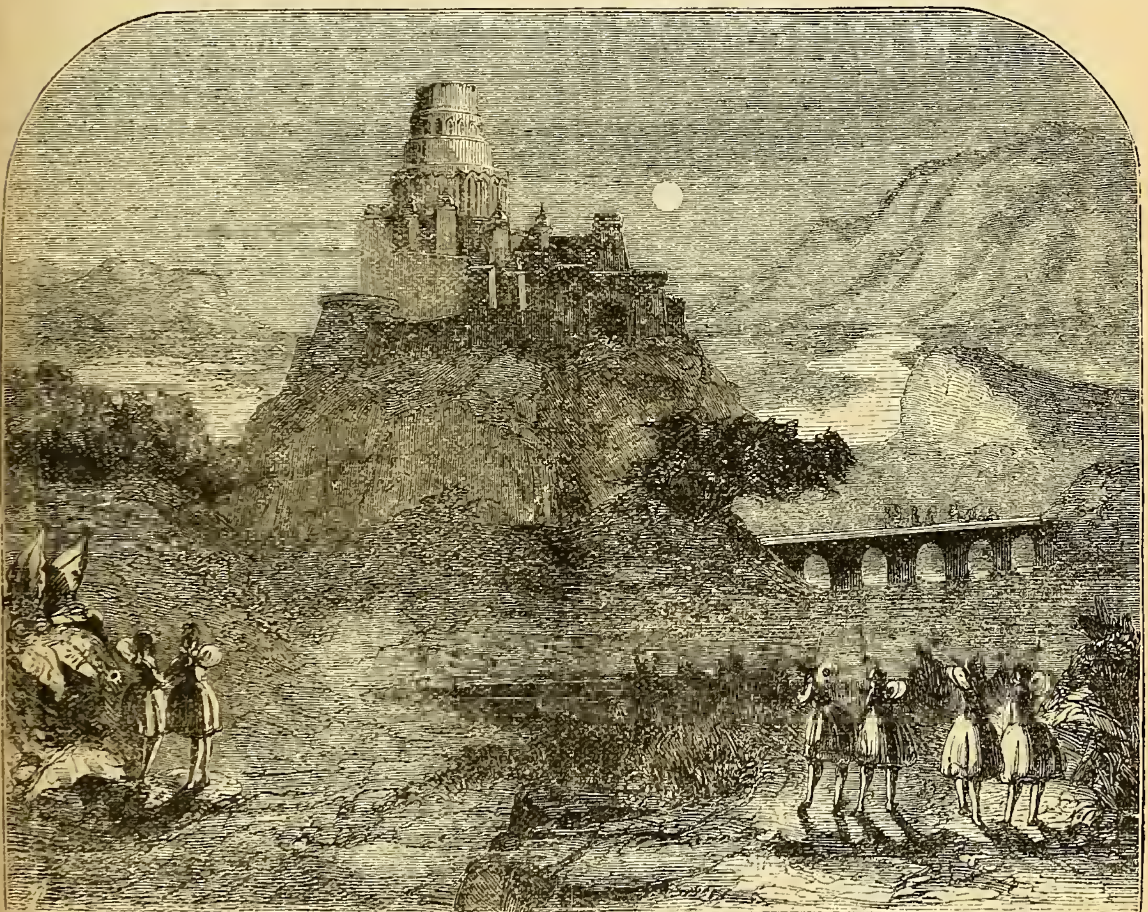


FIG. 2.—SCENE FROM "ALONZO THE BRAVE." FROM THE "ILLUSTRATED LONDON NEWS," CHRISTMAS, 1851.

immortal Beefsteak Club. Amiconi also decorated the ceiling of Covent Garden with groups of heathen deities. Garrick—acting on the suggestion of Dominico Angelo, the famous fencing master, and Signor Servandoni, who was principal painter at the opera house—introduced many novelties in the way of set scenes and transparencies, by which the London playgoers were both astonished and delighted.

The first transparent scene was, I believe, the enchanted wood in "Harlequin Invasion," which was painted for Drury Lane Theatre by an artist of no mean talent, named French, who was not, it was said, too well paid for it. To improve the effect of this scene, Angelo so arranged screens that they reflected lights of different colours upon it, and thus suggested the introduction of those coloured fires which have been so conspicuously prominent in similar scenic effects. The new transparent scene was such an attraction that plays were devised and written for the express purpose of introducing it. The famous De Loutherbourg, being engaged by Garrick, carried this class of stage effects far beyond anything that had been before attained, and in the realization of natural and picturesque effects carried scenery to a pitch of perfection previously undreamed of.

De Loutherbourg, however, designed and painted the models only, and never in his life put brush to a pair of flats in the painting room. Probably the greatest care bestowed upon the getting-up of Shakespearian pieces was shown during the management of Charles Kean at the Princess's Theatre; sometimes twelve months were taken up in the production of some of the plays; but although every piece produced was highly successful from a critic's point of view, it was not so financially. The outlay was too great, and though the "houses" were crammed every night, the theatre did not hold sufficient money to return a profit; but the lucky ones who witnessed the performances in question will probably never forget them—the scenery, properties, dresses, and decorations were so scrupulously correct, and so carefully and conscientiously produced, and the best authorities being consulted in every case. In the "Merchant of Venice" a charming effect was produced with a singular degree of reality, in the scene outside the Jew's house. We had the canal and the bridges crossing it, and the gondolas passing under the bridges, casting as they moved their own reflections in the water. Glass was first tried to produce it, but it failed to have the desired effect, and at last a kind of wet oil-cloth was used; hence every object passing over or near it—the boats, the bridges, and the actors—had natural reflections. This effect, curious to say, has never since been attempted.

It was during Madame Vestris's management at the Lyceum Theatre that Mr. William Beverley introduced burlesque scenery, which was and is similar in appearance to pantomime pictures. The kind of decorated scenery introduced here by Mr. Beverley was at the time quite a new style. What eye-witness of the work he then produced can forget the manner in which "The Island of Jewels," "The Silver Branch," and many other scenes, were produced?

Amongst the celebrated scenic artists whose works are in existence we may mention Clarkson Stanfield, R.A., whose exquisitely-painted shipping and marine views stamped him the first artist of the day. The last piece he painted for at Drury Lane Theatre was "Acis and Galatea," in which he was assisted by William Telbin. This was the stepping-stone for Telbin from Astley's to Drury Lane, and from that time he always held a principal position as one of the finest landscape scene painters on the stage; he was, however, also a great painter of draperies. David Roberts, R.A., did some glorious work in scene painting, which had much to do in the formation of his style; this is well known to all art students. C. Marshall's scenery gained high repute for architecture. Other clever artists known to theatre-goers, and whose works deserve mention, were Turner, Tomkins, Pitt and Gates, whose pictures well deserve the student's attention.

Rapid strides have since been made in the Scenic Art, the height of perfection having been attained in the "Earthquake" scene at the Princess's Theatre in the classical drama of "Claudian." Probably the most successful artist of later days has been Mr. William Beverley, who supplied such splendid scenery to Drury Lane Theatre during Mr. Chatterton's reign at that establishment. One of the best pictures, however, I have seen from his brush, taken as a work of art, was a scene in "The Silver King," which was called, "A Country Lane." Probably several of my readers had an opportunity of seeing this magnificent and recent production. No doubt the climax of scenic art was reached when Mr. Henry Irving undertook the management of the Lyceum Theatre, and mounted his productions in that superb manner which has been such a well-known and characteristic feature at his house. Many visits have I paid to the Lyceum in order to feast my eyes on the scenic displays alone, the play and acting being quite a secondary consideration with me on those occasions. The principal scenic artists of the present day, besides those already mentioned, are Messrs. Bruce Smith, E. Ryan, Stafford Hall, Walter Hann, T. W. Grieve, John O'Connor; and in the provinces, Messrs. Brunton, Charles and Barry Parker, of Liverpool, also G. Jolly, Myles Jones, and Messrs. Hamilton. The artists in London who undertake to paint scenery by contract

and for amateurs are Messrs. E. W. and A. Williams, 486, *Southwark Bridge Road, S.E.*, and Mr. J. T. Bull, 134, *New Kent Road, S.E.*

The illustrations accompanying this chapter, which are reprints from the *Illustrated London News* of Christmas, 1851, are fair specimens of the scene painting art some thirty years ago. They may also serve as suggestions for scenes for the amateur to attempt. In such cases, they should be drawn in an enlarged form, and coloured to fancy with water colours; the amateur will then be able to work from them, if drawing from scale. Of course these prints can only be taken as rude examples suitable for a small stage, and may be easily altered or made easier, to suit both the nature of the scene required and the ability of the painter. I shall no doubt refer to these engravings at some future time, in the meantime leaving my readers to consider whether scene painting, as a means of instruction and harmless amusement, is worth taking up or not, and trusting at no distant date to find this question freely discussed in the pages of our admirable friend and counsellor, AMATEUR WORK.

(*To be continued.*)

THE CAMERA OBSCURA:

ITS USES, ACTION, AND CONSTRUCTION.

By H. C. STANDAGE.

THE use to which a camera obscura is now put is chiefly that of affording amusement to children. Such for instance, as the dark chamber at the Crystal Palace. Doubtless, all of my readers are familiar with the picture depicted on the plaster table in the centre of this chamber, where a tableau of all the objects in the Palace grounds is shown in their natural colour and motions. But formerly this apparatus was used for drawing and photographic purposes. Its disuse for such purposes is chiefly due to better and vastly superior instruments; although, should anyone wish to trace an accurate outline of a landscape on a miniature scale, the camera obscura holds its own, in the matter of convenience, against all comers.

There are several forms of apparatus, but the principles of their action are the same in all instruments.

To easily comprehend the action of the camera obscura, it will be better to describe the principles which refer to any one form of the apparatus. Turning then to Fig. 1, we notice the following peculiar properties. A is the wooden case or box for holding the lens B, of the shape shown in the figure. C is an opening in the side of this box; this opening is for the purpose of allowing light rays from the distant landscape to impinge on the convex surface of the mirror; while D is another opening at the bottom of the box to allow these rays—which are reflected from the back of the lens, which is plane—to pass through this opening on to the table or sheet of paper E, placed ready to receive them. For the purpose of collecting these rays, so that they shall not scatter, but define the external landscape with distinctness, the bottom of the lens is concave, but with a larger radius of curvature than the first surface.

The box A may be square or cylindrical, and it can also be made to revolve horizontally. The inside of it should be blacked with lampblack, so that the full effect of the lens may be utilized by the lens.

The mirror B in Fig. 1 is of a peculiar shape, and consequently not always obtainable; in such cases the following method (Fig. 2) of constructing the camera will answer the same purpose, since the action is precisely the same.

A, A, A, are the sides and top of the box holding the lens, C is the opening for the passage of the rays from the external landscape, while B is a plane mirror placed at an angle of 45° with the opening, and consequently with the convex lens F, which is fixed horizontally. In this construction we see that the rays strike directly on a plane surface, from which they are reflected, and pass through a convex lens. This is the form of apparatus we shall adopt in the instrument we shall now describe how to construct.

One essential point, however, must be attended to in the construction of the camera, else the instrument will not work satisfactorily. It is this, the drawing paper or table which is to receive the image must be at a definite distance only from the lens, otherwise the picture represented will be blurred and confused. This distance is determined by the *focal length*,* as it is termed, of the lens. A greater sharpness of outline is also obtained by having the receiving surface hollowed out to the same curve as the lens; thus, the table at the Crystal Palace camera obscura is made of plaster of Paris, hollowed out to a concave form, the curvature being similar to the convexity of the lens.

The simplest form of a camera may be made by fixing a convex lens in a hole in the window shutter. This lens should have a focal length of five or six feet, and at nearly half the focal length of the lens place a looking-glass (*i.e.*, a plane mirror; a sheet of ordinary glass covered on one side with lampblack

* To render this paper intelligible to those who know nothing of the principles of optics, I will explain the meaning of this term presently.

will answer the same purpose, provided the unpainted side be turned towards the lens) at an angle of 45° with the axis of the lens. If then a sheet of paper, or a white cloth, be held at a distance from the looking-glass equal to the distance the latter is from the lens, an exact picture of the external landscape and all the objects outside, whether in motion or not, will be represented on the paper or cloth. Every colour and movement of the animate objects will be seen as if the spectator were looking at them direct. Note that the objects are in a reverse position to what they are in nature, unless the spectator looks at them with his back towards the lens in the shutter: to anyone in such a position they will appear correct.

For greater distinctness the lens should be fixed in a tube a few inches long, and the tube fastened into the shutter. Of course, no light must enter the room except that coming through the lens.

There are two very good forms in which a portable Camera Obscura for drawing purposes can be made, which I will proceed to describe.

With regard to the *construction* of the camera shown in Fig. 3, in order to make a cubic box measuring 9 inches every way on the outside, plane up a piece of board 9 inches wide and ¼ inch thick, and then saw off five pieces, two of which are 9 inches by 9 inches, or 9 inches square, which we will call B and C; one piece 9 inches by 8½ inches, which we will call A; and two pieces 8¾ inches by 8½ inches, which we will call D and E.

Take one of the pieces measuring 8¾ inches by 8½ inches, and cut a circular hole in it, 2 inches in diameter; this hole is to receive the tube A containing the lens B. Next nail the five pieces together into the form of a box. Since there are six sides to a box, we shall have one side open; this open part is to cover the aperture in the larger box C.

To nail the five pieces of wood together into box form proceed thus:—Nail the pieces B and C (Fig. 5), which are 9 inches square, to opposite edges of the piece A, which is 9 inches by 8½ inches. We now have three surfaces of the box of equal areas, namely, 9 inches by 9 inches, because the breadth of A, namely 8½ inches, is supplemented by the thickness of the sides B and C that are nailed to it, and thus brought up to 9 inches, because 8½ inches + ¼ inch + ¼ inch = 9 inches. The pieces D and E, which have been cut to the size, 8¾ inches by 8½ inches, are now slipped in between the boards that have been already nailed together, so that one of the *short* ends of each rests on A, the long ends abutting against B and C, when it will be found that the edges of B, C, D, E, at the opening of the box, will be flush with each other. It is necessary to take care that they are exactly flush, in the construction of the camera, else, when this small box is secured to the larger one, it will not fit close, and consequently light will enter the apparatus.

When this box is made, place a plane mirror with the reflecting surface opposite to the circular aperture. This mirror is to be inclined to the side of the box where this circular aperture is, at an angle of 45°. Since our box is cubical, the mirror will divide the box diagonally, as shown by the surface indicated by dotted diagonal lines in Fig. 5. To keep this mirror in its place, it should rest on a strip of wood (about ⅛ inch thick), at the end E. This strip of wood is 8½ inches long, and should be glued in after the mirror is placed in position. The size of the mirror will be as nearly as possible 12 inches long by 8½ inches wide, the diagonal of a square (not of a cube) of 8½ inches being very nearly 12 inches. Remember the length of the mirror is only equal to the diagonal of one *side* (as C) of the cubical box (see Fig. 5).

The next proceeding is to construct the larger box C (Fig. 3). This has five sides, and is constructed after the manner of that described in Fig. 5. The top, D, of Fig. 3, has a hole 8½ inches square cut out, over which the smaller box is placed. This hole should be cut out of D previous to joining the sides together. The easiest way to cut out this square is to use a keyhole saw; thus, mark off on D, with pencil, the part to be cut out, then at each corner bore a hole with a gimlet large enough to let the end of the keyhole saw enter; insert the saw in one of these holes, and follow the pencil mark for one side of the square to be cut out; when the next corner is reached, the gimlet hole will permit the saw being reversed and follow the next pencil mark, *i.e.*, that at right angles to the first. Follow the other pencil marks until the hole where the saw first entered is reached. This hole is half an inch less than the size of the small cubical box, so as to allow a foothold for the latter to rest on. The smaller box is secured to the top D by means of four angle brackets E; these brackets should be about 1½ inch long in each limb and ½ inch wide, screws ⅜ inch long being used, care taken that the holes for them are not bored too deep nor penetrate through the wood.

The floor of the larger box forms the bed or table on which the sheet of drawing paper is laid. The open side of this larger box is covered with a cloth G, having a hole, H, for the operator's head to pass through, and another, I, for his arm. When the instrument is in position, the operator inserts his head through H and his right arm through I, and sketches off on the drawing paper the picture represented thereon. This cloth should be stretched across the box tight enough to exclude all light. On two sides, it should be nailed permanently to the box (say at the top and right side), while at the other sides it is secured by eyelets in the edge of the cloth being fastened on to nails or

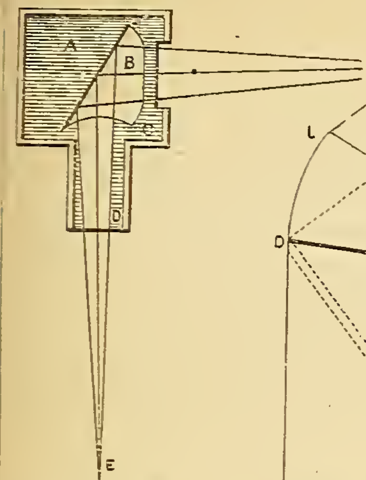


FIG. 1. CAMERA TO RECEIVE IMAGE ON HORIZONTAL TABLE

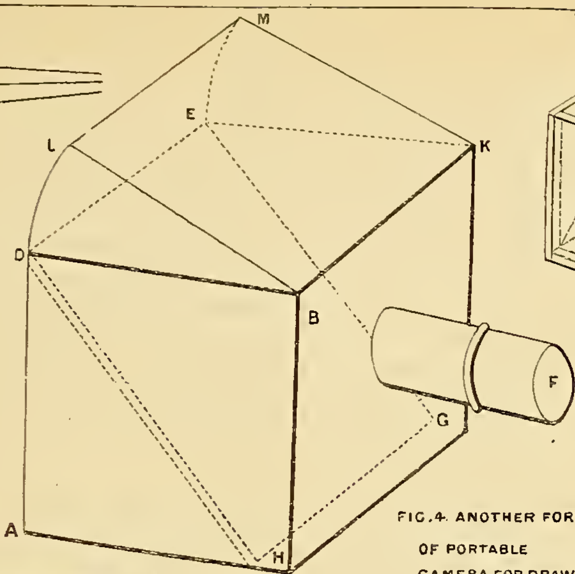


FIG. 4. ANOTHER FORM OF PORTABLE CAMERA FOR DRAWING PURPOSES.

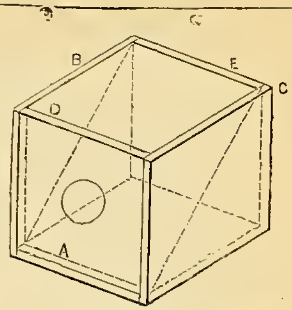


FIG. 5. FORMATION OF CUBIC BOX FOR CAMERA.

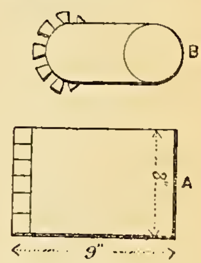


FIG. 6. INNER TUBE FOR FOCAL ADJUSTMENT

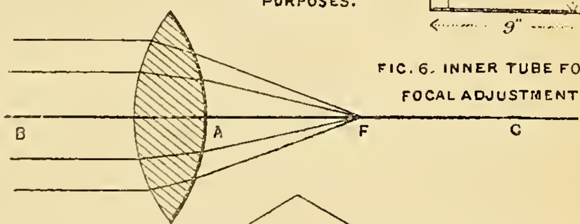


FIG 7. DIAGRAM EXPLAINING FOCAL LENGTH.

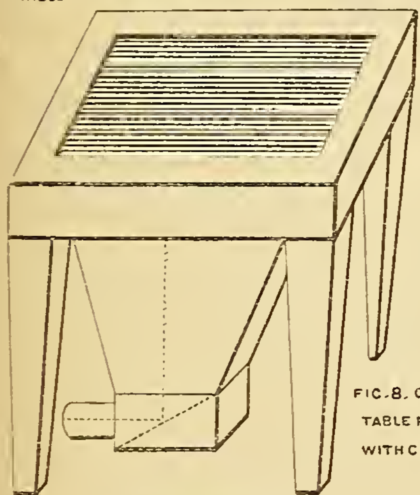


FIG. 8. ORDINARY TABLE FITTED WITH CAMERA

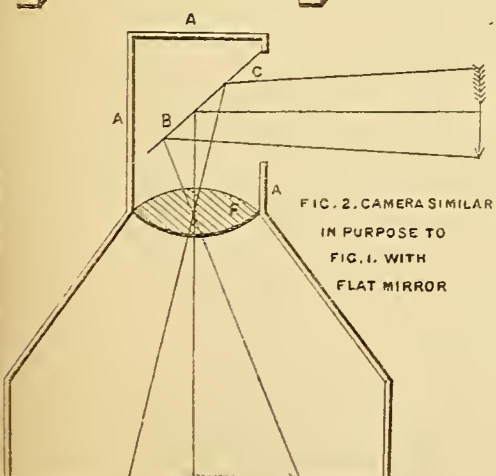


FIG. 2. CAMERA SIMILAR IN PURPOSE TO FIG. 1. WITH FLAT MIRROR

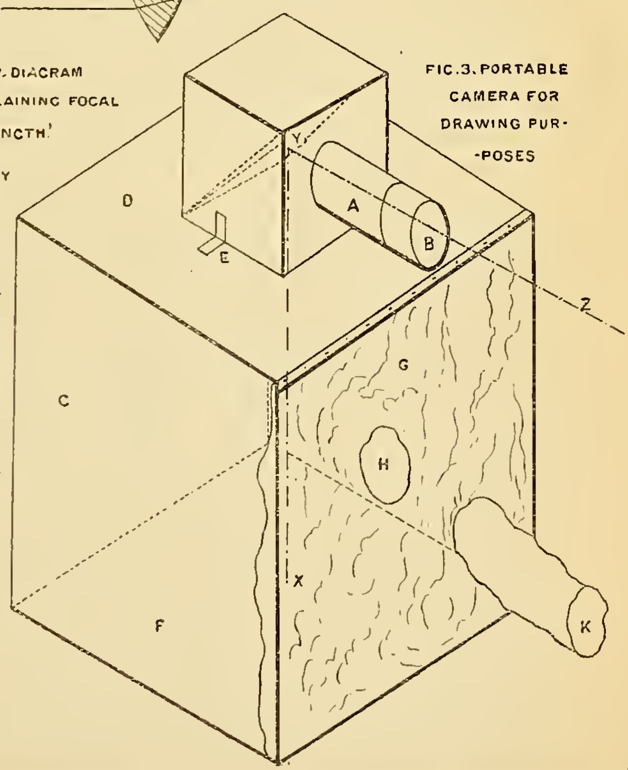


FIG. 3. PORTABLE CAMERA FOR DRAWING PURPOSES

hooks fastened on the sides of the box. This cloth or curtain is purposely made to open so as to permit the insertion or removal of the drawing paper. A piece of baize or cloth impervious to light is the best to use. For the purpose of focal adjustment the tube A should be double—that is, one holding the lens should slide in an outer casing. This tube is best made of sheet brass, with the joints soldered or brazed together; any tinman or smith will make this tube for a trifling sum. Should the amateur desire to construct it himself, he must proceed thus:

Take a piece of sheet brass, or zinc (the latter will do equally as well), 7 inches by 7 inches, and bend this over a wooden roller or piece of gas-pipe, or some other cylindrical article that is 1⅞ inch in diameter. One edge will overlap the other something less than an inch. This edge is then to be soldered. Next take a brass curtain ring exactly 1⅞ inch outside diameter, and solder this in one end of the tube. This ring is to prevent the lens falling out at this end of the tube. After this ring is soldered in, insert the convex lens from the other end of the tube, push it close up to this ring, and then put another one behind it. The latter one it is impossible to solder in, but the roughness of the inner part of the tube will not allow it to fall out easily. Make the soldered joint of the tube as thin and even as possible, else when it slides in its outer casing a ray of light will penetrate into the box along side this joint. The outer tube is constructed in the same manner as the first, the internal diameter of it being just equal to the external diameter of the inner tube. The sheet of metal of which this outer tube is made should be about 9 inches long by 8 inches for bending into tube form. But across one end of the 9-inch length the metal should be slit at intervals of about an inch (shown in Fig. 6, A), so that when the metal is bent into cylindrical form these slits will allow the metal to be bent back at right angles to the axis of the tube (as shown by B, Fig. 6). These flange pieces are for the purpose of fastening this outer tube to the smaller box in Fig. 3, so as to cover the circular aperture therein.

Now comes one special point to attend to, and that is, the focal length of the lens. This "focal length" should be equal to the length of the dotted lines, X Y, Y Z—that is, it should be equal to the distance between the lens at Z to the mirror at Y, and from the mirror at Y to the bottom of the box at X. If the pictorial image at X is blurred, the tube holding the lens B should be adjusted (by drawing it out, or *vice versa*) until the image is distinct. Should the image then remain unsatisfactory, make a false bottom on which to place the drawing paper. This is easily accomplished by putting a drawing board or a smooth surface inside the box, and raising it to the required height by placing books or blocks of wood, etc., underneath. The plane mirror in the small box should be distant from the lens B, not quite equal to half the focal length of the lens, while, at the same time, the sharpest picture will be represented at a distance from this mirror at a like distance. The size of our box will take a lens having a focal length of 3 feet, when the most distinctly outlined picture will be represented at about 11 inches above the bottom of the box. By making the tube A longer than the dimensions given, a lens of 3 feet 6 inches to 4 feet focus may be used; but in no case should the focal length be too great for the size of the apparatus—that is, the focal length should not be so great as to depict the picture most distinctly below the bottom, as it were, of the larger box.

A few words of explanation of "focal length" will prevent all confusion in the minds of all such as have no knowledge of optics. In Fig. 7 I have represented a section of a double convex lens (such as is used in our camera); the line B C, passing through the centre of the lens at right angles to its surface, is called the principal axis of the lens. Now, when rays parallel to this principal axis pass through a convex lens, the effect of the two refractions (refraction means bent or broken out of its course) which they undergo—one on entering, and the other on leaving the lens—is to make them all converge approximately to one point, F, which is called the *principal focus.* The distance, A F, of the principal focus from the lens is called the *principal focal distance*, or more briefly and usually, the focal length of the lens. Every school-boy, when he converges the rays of the sun on to the skin of his wrists (for raising a blister, as some young rascals do, so that they shall be unable to do their writing lessons), or to light a match or paper, knows the principal focus, for it is that point where the heat is most intense, or the spot of light formed is the most minute. The focal length depends on the convexity of the surface of the lens. Consequently, a lens 1⅞ inch diameter which is thicker in the middle than another of the same diameter, will have a greater focal length than the latter. The focal length also depends on the refractive power of the material of which it is composed, being shortened either by an increase of refractive power, or by a diminution of the radii of curvature of the faces.

Another form of a camera obscura for drawing purposes is shown by Fig. 4. This form is perhaps the handier of the two. In this figure the box, A F, is cubical, and the focal length of the lens is equal to the distance F is from the side, A D E, of the box. By placing the mirror, D E G H, at an angle of 45° to

the axis of the mirror, the picture instead of being depicted on the side, A D E, is reflected into the top, D E K B. This top is formed of a sheet of glass ground on one side, tbe smooth side being undermost. On this ground surface, the landscape, etc., is represented in all its natural colours. The objects represented can be drawn on the glass with a pencil, and afterwards copied off thus : Let tbis glass top be movable, then, when the picture is stretched on it in pencil, remove it, and lay it on a reflecting surface, sucb as a looking-glass, or brightly-polished sheet of metal. Then, if a piece of tracing paper is laid on the ground glass, the design will be rendered deep enough to be traced on the paper. If this paper be used, the design can be copied off the ground glass when the latter is in position in the camera.

In Fig. 4, B L M K is a lid, and B D L, K E M, side pieces that hinge on the box for the purpose of excluding extraneous light falling on the ground glass; tbus the picture represented thereon is rendered doubly intense.

This last form of the camera obscura may be turned into a source of amusement, and will cause astonishment and wonder to anyone not acquainted with the construction of a camera. Thus, Fig. 8 represents an ordinary table with a piece of the top cut out, and a sheet of ground glass let in in its place. The camera is fixed beneath tbe table as shown. Tbe way to use it is as follows : Let the table stand against the sbutters when they are closed, a large table-cover being placed on it, and falling about its legs so as to bide the camera. A hole must be made in the shutter just suitable to admit tbe tube containing the lens (the lens need only just cover this hole). When you wish to astonish the company present by telling them you can show them all that is passing outside the house witbout the necessity of them leaving the room, all you have to do is to place them round the table, darken tbe room, and withdraw the table-cover. The company will be highly amused by the verification of your words, for on the table top will be represented a faithful picture of all external objects,

Instead of the external landscape, the doings of tbe party in an adjoining room can be shown to the company if the lens be placed against a hole cut in the folding doors between the apartments. There are many otber ways in which such a table can afford amusement to a company during the dull winter evenings. Thus, the following is suggestive of many others. Have two or three confederates, and let them absent themselves from the company silently. After a short time commence operations by asking where they are, or if anyone knows what tbey are doing. When the excitement for their appearance is eager, and some wish to go in search of the fugitives, offer to call in the aid of spiritualism for their discovery. Some will doubt your ability to do so. So to verify your power, get them to stand round the table (of course they can only stand round three sides of it), and take each other's hand. Darken the room, and then ask one of the company present which of the absentees it is desired to know about. On her name being given, call for her in a loud voice, "Spirit of Alice, come forth and show what Alice is doing." At that moment pull away the cloth, and Alice will be represented on the table top, either at needlework, dancing, skipping, etc. In a few seconds replace the cover, and ask which other absentee shall appear, and repeat the question and operation.

Since the person will be represented on the table top in her natural colour and motions, extraordinary astonishment will be caused, and almost a belief in your power of spiritual agencies. Of course, you must have previously told the absentee confederates what to do, and whenever one is called (you must call her name loud enough for her to hear it in the next compartment), the other absentees must place themselves out of the camera's range. To produce greater mystery, so that the company shall not recognize what room the absentees are in, let a screen or two form a background to the confederate persons and their movements. A sliding top to the table instead of the cloth is a still better arrangement.

INSTRUCTIONS FOR BUILDING A SAILING BOAT.

By J. STUART ELLIS.

I.—PLAN AND SECTIONS OF BOAT—MODE OF DRAWING THEM—THE KEEL—REBATES IN KEEL—STEMPOST AND STERNPOST—PLANKING—BEVELLING, FITTING, AND FASTENING PLANKS.

THE very first thing of all when one wants to build a boat, is to settle definitely the type of boat and the use to which one wants to put it. The boat described in the following article is of that kind generally known as a "dingy," a good safe boat which will stand a good deal of sea. The following are its dimensions :—length, (over all) 13 feet ; length on L. W. L. 13 feet ; greatest beam, 4 feet 6 inches; depth at transom, 2 feet 6 inches; depth at stem, 3 feet. Such a boat would sail two people comfortably, with about 2 cwt. of ballast forward. The lines could either be got as suggested in the former articles on "Boat Building Made Easy," or by drawing them out, as I did mine, by the following method. The requisites for drawing are—a sheet of smooth cartridge-paper, a T-square, compasses,

one or two French curves, and a thin pliant piece of wood called a "spline," this latter is *indispensable* for drawing in the water line curves. A couple of scales, say 1 inch to the foot and ½ an inch to the foot, divided in tenths, will also be found useful.

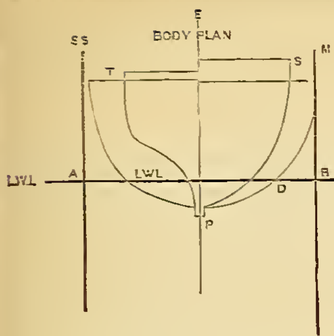
The first line to be drawn in this diagram is that marked L.W.L.(load water line) in the sheer plan, Fig. 1, taking care to leave room above and below for the rest of the drawing. All the sheer plan should now be drawn; as we know the depth and length, we must set to work on the half breadth plan. We have *two* parts, *i.e.*, the midship and the transom; draw in a curve T X with the spline; this gives the gunwale, from which we get the curve M P in the body plan, set off distance, P D, on half breadth plan, as H O, then draw curve with spline through the points P,O,X, and this represents the greatest load water line. With these two curves we can get any number in the body plan.* The points marked S S and S are points at which sections should be taken as marked. By setting off distances, as before, from half breadth on to the body plan, we get the curves shown. Of course, these curves are only half curves, as it were; they must be laid off *full* size on a newspaper, then doubled over and cut, so that we get a *complete* section of the boat full size from the half section in the body plan. These paper patterns should be laid on the floor, and pieces of one inch deal should then be cut to fit the curves exactly; these must be firmly braced together, leaving a space about one inch deep, to fit over the top of the keel. They will then look like Fig. 2, near the middle of the boat, getting more pointed and narrower towards the bows. So much for the moulds on which the planking is afterwards to be fastened.

In order that the boat builder may work at the boat comfortably, the keel should be raised from the ground on a trestle (Fig. 9). The keel should be made of American elm, get a piece 13 ft. by 3 by 3 in., and cut a mortise through it, ⅝ inch wide, 3 feet 6 inches long, the *front* end being 4 feet from the *bow* end of the keel, the *centre plate* will pass through this afterwards. Having done this, the rabbet must be cut which will receive the garboard strake; the section of the keel in the centre will be as shown in Fig. 3. The part shaded is the actual shape; the unshaded is that which must be cut away. Nearer the bow and stern the shape will be more like Fig. 4, as the planks come from the *horizontal* in the middle to the *vertical* at each end. The keel should now be fixed to the stem-post, which should be cut out of 2½ inch oak, the *section* must be like Fig. 5, which also shows how the planking is fitted on. Fig. 6 exhibits the mode of fastening the stem-post to the keel. The post is slipped into a tenon cut in the keel end and through fastened with stout oak pegs; a strong wooden knee is then put inside to strengthen the joint. The *stern*-post will be fastened in the same way, but the shape is quite different. Fig. 7 represents the stern-post joint with the keel, the transom board being in its place as in Fig. 8. The shaded part is the stern-post proper, the unshaded parts are the transom board, and the keel, the dotted lines show where the planking comes. Having put on a knee similar to that used in the stem-post, the keel is ready to be fixed down on to the bed prepared for it. This can easiest be done by putting two large bolts and nuts, one at each end of the slot meant for the centre-plate, and screwing the keel firmly to the trestle; having put *under* the stem-post a piece of wood two inches thick to give the necessary "camber," without which the boat would not steer well. The next job is to firmly fix the three moulds, already described, in their respective places on the keel; a temporary gunwale strake will immensely help this. The transom board should be of 1½ inch mahogany or elm, the stern-post of 1½ inch oak. Our boat has now the appearance shown in Fig. 9.

We are now ready for the planking; this should be ⅜ inch thick, and *no* strake should be *more* than 5 inches wide. The three best materials for the strake are oak, mahogany, and pine; pine is much the cheapest, and if got clean and free from knots is an extremely good wood. The timber required will be twelve boards 15 feet long by 9 inches wide, each one of these must be sawn down the middle, so that each 9 inch board makes two strakes. The *top* strake must be quite one-half thicker, and looks much better if put on in a darker wood, say, mahogany. If the wood is not got in 15 feet lengths, each strake will have to be joined with a piece of one-third the length, taking care when putting on not to let two joints come together, care must also be taken in making the joint, to overlap the piece the right way, *i.e.*, so that when the boat moves through the water, weeds, etc., will not be caught by the joints. The joint itself, a featheredge scarf, should not be less than 3 inches in length. We suppose here that our planks are in continuous lengths. Take a plank 4½ inches wide, fit the lower edge into the rabbet of the keel, and secure it to the stem and stern-post by screw clamps or by cleats. We should have previously marked on all the moulds, "spots" where the strake will come, now mark the places on the strake itself, take it off, and run a line in through these

* The total displacement of the boat when floating at any load water line will be, the length on that L. W. L. multiplied by the breadth on that line, multiplied by proposed immersed depth amidships to RABBET OF KEEL, multiplied by the coefficient 0.3 (this result is in cubic feet) divide by 35, and we have the weight of the boat in tons or fractions of a ton.

Example:—Length, L. W. L.	... ...	13 feet.
Breadth ,,	... ...	2·5 ,,
Depth	... ...	·5 ,,



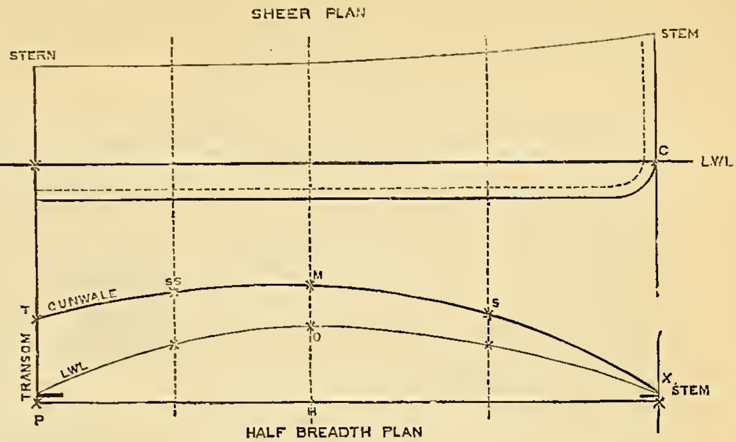


FIG. 1.—SHEER PLAN, HALF BREADTH PLAN, AND BODY PLAN, COMBINED.

FIG. 3.—SECTION OF KEEL IN CENTRE.

FIG. 4.—SECTION OF KEEL NEAR BOW AND STERN.

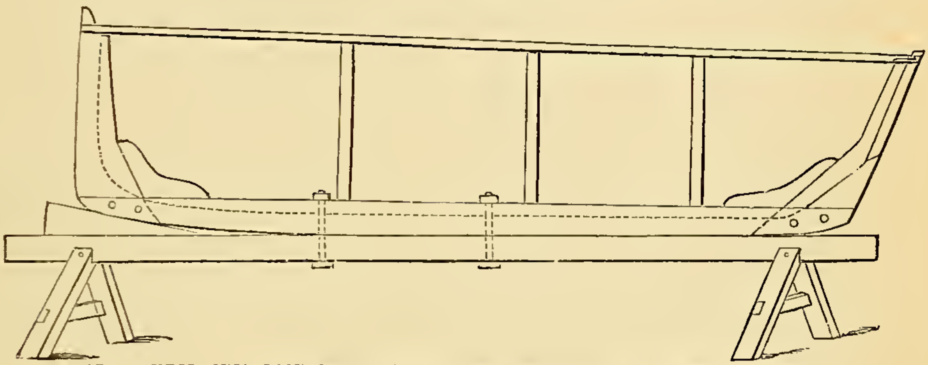


FIG. 9.—KEEL, STEM POST, STERN POST, TRANSOM BOARD, AND MOULDS, ON TRESTLE.

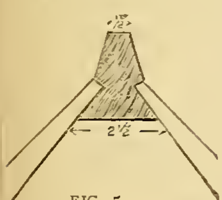


FIG. 5.—SECTION OF STEM POST.

FIG. 8.—CONNECTION OF TRANSOM BOARD AND STERN POST.

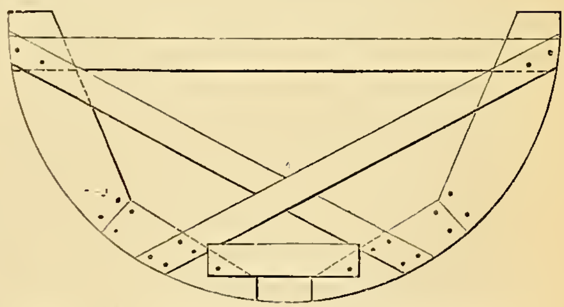


FIG. 2.—MOULD OF SECTION OF BOAT IN ONE INCH DEAL.

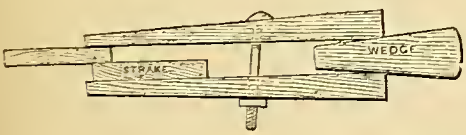


FIG. 10.—WOODEN CLAMP FOR HOLDING STRAE.

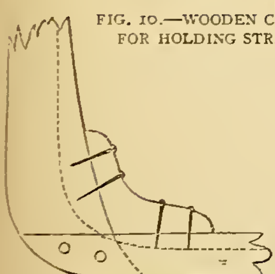
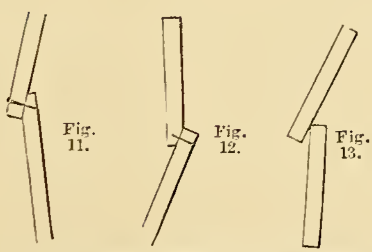


FIG. 6.—JUNCTION OF KEEL AND STEM POST.



FIGS. 11, 12.—PROPER BEVELS FOR EDGES OF PLANKS. FIG. 13.—ABSENCE OF BEVEL.

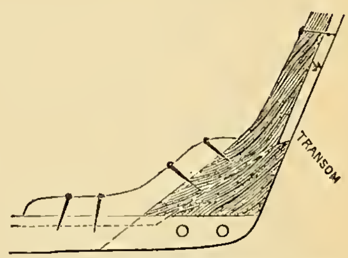


FIG. 7.—JUNCTION OF KEEL AND STERN POST.

marks, saw down this line, plane the wood up, and our garboard strake is ready for use. The line to be sawn will be curved, more or less in each instance; as we get nearer the top of the boat the strakes become more curved. The garboard strake must nôw be nailed into the rabbets of the keel, and stem and stern-posts, with 1 inch copper nails ; don't be afraid of putting these nails in too close together, especially on the posts. The next strake will overlap our garboard $\frac{3}{4}$ inch all the way along. Take the next plank and fit it along the top edge of the garboard outside, clamp it as before, and run a pencil along the top edge of the garboard, take off the second strake and saw down this line, now put it on again ; this time it must be fitted to the $\frac{3}{4}$ inch overlap, and then proceed with the "spots" on the moulds, as we did with the garboard, running in a line and sawing down it, plane up, and the second strake is ready to be nailed on. Some wooden clamps easily made, in this shape, will immensely help us to fix our second strake on to the garboard, while nailing. Two pieces of oak bolted together, loosely, with a wedge at one end. This wedge on being driven in firmly holds the two planks together, as shown.

With regard to the planks the edges will have to be more or less bevelled away, to make them lie on the curved moulds. Figs. 11 and 12 are bevelled properly ; Fig. 11 shows what would happen if they were not bevelled. The strakes will be nailed and rooved, or clinched, all along the overlap at intervals of from 2 inches to 3 inches. At the bow and stern the planks must be bevelled to almost a featheredge, to make them lie flush on the posts, only about four inches at each end need be bevelled as much as this ; ordinarily the strakes should never be bevelled more than half their thickness. All nails must have holes bored for them, care being taken to make the hole smaller than the nail. No difficulty will be found about bending the planks on to the boat without subjecting them to steaming.

So much, then, for the planking. In my next and concluding article I shall speak of the ribs, stringers, thwarts, etc. All sorts of copper nails and rooves can be obtained in small quantities from Dean and Co., 46, *King William Street, London Bridge.* It may be that some amateurs who may be inclined to try their hand at boat building may be deterred by the idea that special skill in carpentry is required for the successful prosecution of the work. This is not so : it is as easy to build a boat as it is to construct a table or chair, or any other article of household furniture. Care, of course, is necessary, and careful fitting of the different parts, but this is no more than is requisite in all kinds of constructive work in wood. (*To be continued.*)

PRACTICAL LESSONS IN WOOD-CARVING.

By E. ARTHUR EDWARDS.

II.—SUBJECTS TO BE TREATED—PRELIMINARY STUDY —SMALL INK-STAND—PROCESSES INVOLVED IN CARVING—POSITION IN CUTTING DOWN.

(*For Illustrations, see Folding Sheet issued with this Part.*)

We now arrive at another important stage in our subject, viz., the designs upon which we are to exercise our skill ; and perhaps if I give a short *résumé* of some of the subjects I am about to illustrate, it may serve to rouse the dormant energies of some who may have tired of the conventional but somewhat unserviceable panel. As an introductory lesson in low relief work, we might take an ink-stand of simple design, and requiring but the merest smattering of carpentry knowledge for subsequent fitting up. And when the details have been thoroughly mastered, we will proceed to attempt, among other things for the embellishment of the room, etc., paper knives, cribbage-board, book-slide ends, reading-easels, glove-boxes, book or blotting-case covers, book-shelves, cabinets, door and finger panels ; and in carved fretwork, brackets, letter-racks, pipe-racks, with numbers of the articles described in the fretwork pattern books. These all offer great facilities for the treatment of leaves, flowers, and fruit, and are best adapted for our present purpose : the beginner should not be slow to take advantage of the numerous examples nature affords on all sides.

As an introductory lesson, a pattern for a small ink-stand is given, Fig. 7, which I think has the merit of being simple and yet effective. It might be done in pear or walnut (English being more satisfactory for carving than American) ; and as such wood will always be useful, 2 or 3 feet or more may be ordered. Take an exact copy of the pattern upon tracing paper *in outline only*, omitting the veins and smaller details. Gum this to the wood, and saw out the octagon. Bevel the edge on each side as in Fig. 8, leaving the narrow rim intact. The lower portion, A D B, shows the stand after the first process of blocking out, and the upper portion, A C B, shows it in its completed state.

The glass should be purchased before the rim enclosing it is cut, so that a perfect fit may be obtained. Fig. 8, showing a section at A, B, will give an indication of the depth of groundwork. The dotted lines show the probable contour of the leaves at that spot and their appearance when the undercutting has been done.

There are four distinct processes to be mastered, and they come in this order : "cutting down" the out-

lines of the stalks, leaves, etc., to the required level, "blocking out" or cutting away all the blank spaces until the groundwork is reached, "carving," or investing with artistic merit the blocks so left, and "finishing" by scraping, stamping, and polishing the pattern according to the taste of the worker. First, then, "cutting down." Start with I G in the right hand, as in Fig. 6, the forefinger of the left hand pushing and guiding tbe tool with each stroke. This tool is the most useful until the small short curves are reached, when of course it must be discarded for one more closely following the pattern. Start at E, following the inner rim all round, cut perpendicularly to about ⅛ inch deep in the first place, working along each portion of the pattern until all the ink lines have disappeared, and given place to cuts. This line of cuts must be continuous, so that no particle of the pattern is left untouched, and to effect this, the tool should never be taken quite out of the wood. Work it as you would a crowbar in moving a heavy log. In that case, you would put the point under the log, and push your hands away from you, repeating the operation with every forward movement of the log : so with the tool ; push the point nearest to you ⅛ inch into the wood, and move tbe handle forward until is perpendicular, then, witbout taking tbe tool quite out, push it with the left forefinger along the pattern about three-quarters of its length with each stroke. This with a little practice will be found to be the best way of keeping strictly to tbe line, as the remaining quarter serves as a guide for the coming stroke. Where the stalks are thin, er where the leaves are pointed and serrated, a dotted line $\frac{1}{16}$ inch wider on each side should be drawn, and in the first place this dotted line must be followed instead of the actual outline, or in the blocking out process the tool might slip and the stalk disappear. A considerable amount of pressure is necessary to obtain this ⅛ inch depth in the harder woods and against the grain, but it must be very regular. When the whole of the pattern has been followed, it must be gone over again with the same tool to a greater depth, ¼ inch if possible, from the surface, and then it will be in a fit state for blocking out. For this operation I G is again the most appropriate, but it must be held as in Fig. 5, and the wood held firmly by the pegs. Cut a sort of trench ¼ inch wide, down to the bottom of the cutting out line, and widen this more and more, until the whole of the groundwork is cut away to the same depth—¼ inch. Where the spaces between the leaves are narrow, I or 2 B, C, will be found the best for the job, but it should always be commenced with a flat gouge. Great care must be taken to get the same level *throughout* for this groundwork, as the general appearance of the work is materially affected thereby, and when finished the carved work should almost give the impression of having been glued to a flat surface. Fig. 7 shows the work as it would now appear in section.

We now come to the most important of all, viz., carving the actual pattern, and it is here that everything depends upon the individual taste and artistic feeling of the worker, the great desideratum being to impart an easy natural grace to each leaf and flower, giving plenty of variety and at the same time preserving the characteristics of the subject matter. Owing to the necessarily large amount of rudimentary information in this article, I am unable to give more than one sectional drawing showing the work in progression, but in future I hope to go into this more fully. It is a good plan to collect dead leaves, etc., in the autumn, as they are better adapted for copying when shrivelled than in their green state. In order to give a natural and life-like appearance to each leaf, it is necessary to form some sort of plan for its formation, and to determine which parts shall be depressed and which elevated. When this has been done, mark two or three spots for the depressions, and proceed to dig out round or oval holes of various sizes to about three-quarters of the leaf's thickness. They must vary in position with each leaf, as they are a foundation for the subsequent modelling upon which everything depends. The depressions must now be joined, as it were, by shallow ridges cut with various sized gouges—a broad one here, a narrow one there ; and they need not necessarily be straight or all on the same plane. Each tool-cut will leave two angles or ridges, and these must all be carefully cut away by very small degrees with the broader and flatter gouges, until the whole leaf gradually becomes almost as smooth as leather. It is certainly no easy matter at first to obtain this result, but familiarity with the tools will quickly breed contempt for such little difficulties. Where it is found impossible to remove all the tool-marks without making others in the attempt, recourse may be had to scraping, though this is not desirable : for this purpose I G should be held by the shaft lightly between the fingers almost perpendicularly, and scraped along the surface *backwards*, when the offending edge will quickly be removed. It is quite impossible to lay down many rules for the moulding process, but with plenty of practice and patient adherence to these few principles, creditable workmanship will assuredly follow. We now come to veining, and this again is a difficult subject to grasp all at once. The best way is to practise on deal against the grain, until good bold cuts are obtained ; some flourishing pattern should be drawn and closely followed with I or 2 V, the line being deep and shallow alternately. The tool must be held very firmly in the right hand, at an angle

of 45° to the wood, and prevented from slipping by the left forefinger. When a tolerable amount of proficiency is obtained, it may be tried on the leaf commencing at the stalk with a deep wide cut, and getting gradually finer till it fades away to nothing at the further extremity. All the veins should be marked with a pencil just before beginning to cut, and the lines should be gently curved following the contour of the leaf as much as possible. When the main lines are finished, viz., those from the stalk to each point, the branches must be cut. They should be very numerous, slightly curved, and deeper at the junction with the main line than at the further extremity. The greatest care must be taken to get each vein cut with one single stroke of the tool; there must be no breaks or slips, as any mishaps of this kind would immediately spoil the whole effect.

The edges of the leaves must now be trimmed up or "undercut," so that the eye may not catch the thickness of the wood. At present the angle formed by this thickness and the groundwork is probably obtuse (Fig. 8). It must be carefully shaved off and rendered acute by the undercutting process. With a few words on finishing the stalks and groundwork, I must conclude this article, and enlarge upon the whole subject on a future occasion. Round off the edges of the stalks with a small gouge, but do not keep them all too stiff and straight like wiie; slice a piece off here and there to give them an irregular appearance, and then run I V lightly along the top, but in this instance the line must *not* be continuous, but broken frequently, and twisted partly underneath the stalk at times, and recommenced on the opposite side.

The groundwork is vastly improved, and nearly all the roughness disappears by the use of a stamp or punch, and this must be kept sharp with a file, or a mallet will be necessary. A good dull polish for the leaves is obtained by putting a little beeswax on a hard 4d. nail-brush, and using plenty of elbow grease. This is much more satisfactory than any French polish for carved work, and more easily applied.

I strongly advise intending carvers and woodworkers residing near London to join Mr. Syers' classes for practical instruction (of which he will send a syllabus on application.) More can be learnt in a few hours under a good teacher than by any amount of correspondence. The classes to which I refer are conducted by practical teachers, acting under Mr. Syers' superintendence, at the Finsbury School of Practical Mechanics, to which attention has been already more than once called by the Editor in "Amateurs in Council." A visit to the workshops at *Finsbury Square Buildings*, *Chiswell Street*, *E.C.*, will afford the best evidence of their completeness and utility to amateurs.

(*To be continued.*)

VELOCIPEDES:

THEIR CONSTRUCTION AND USE.

By A. STEPHENSON.

V.—SPRING, SADDLE, AND PEDALS—LAMP, ETC.—PAINTING.

WE now come to notice the remaining fittings of our bicycle, namely, spring, saddle, and pedals. There are many different kinds of springs for bicycles. The ordinary bicycle spring is shown in Fig. 33, and consists of a strip of spring steel some 18 inches long, a little over $1\frac{1}{2}$ inch broad, and fully $\frac{1}{8}$ inch thick. The fore end, A, is forked and turned under, forming an eye for the bolt to fix to the mane or neck of the machine. The tail end is tapered to about $\frac{3}{4}$ inch, and slides freely in the piece, Fig. 34, which is a small casting in brass, and is fixed by two screws to the backbone, Fig. 35. Play is thus allowed to the spring when the weight of the rider is upon the saddle, the narrow end protruding through the slot further as the weight is increased, and if the spring is properly made and tempered, it will always rise to its proper and original curvature when the weight is removed.

The above form of spring is the cheapest in the market, and will be found very serviceable, though for long distance riding there are others, such as the "Arab cradle spring," said to be considerably easier. As its name implies, it has a rocking motion sideways as well as vertically, thus yielding to the various motions of the body of the rider.

The pin for the spring is simply a $\frac{5}{16}$ inch or $\frac{3}{8}$ inch bolt and nut, the head and nut being hexagonal. It may be readily bought along with the spring.

Like the springs, there are various makes of saddles. The old-fashioned saddle was rather a trying affair for a lengthened journey. It consisted of a piece of sheet iron pressed into a convex form on the upper side, a thin coating of horse-hair, and over that a piece of leather stretched and sewed round the edge. This kind of saddle is now only found upon old bicycles, having given place to several greatly improved makes, notably the suspension saddles of "Lamplough and Brown." In these saddles the leather is held in tension by springs and screws underneath. They are also ventilated, which greatly adds to the comfort of using them.

The saddle is fastened to the spring by two screws with nuts, projecting downwards, one on each side the spring. A cross clamp of iron having two holes to receive the bolts, see Fig. 36, is placed on them after the saddle is placed in position on the spring, then he nuts are screwed up, pressing the clamp tight

under the spring, thus holding the saddle firmly in position. It is also adjustable backwards or forwards to any required degree, but cannot be raised or lowered. If, however, the machine is the proper size for the rider, a vertical adjustment of the saddle is not requisite, and attention is not usually given to it in bicycle making, I should advise every rider, whatever his machine may be, to procure a really good saddle, as upon this depends in a very great measure the comfort and pleasure of bicycle riding.

As to pedals, we have two kinds—Rubber and Rat-trap—and a combination of these to suit the contingencies of the weather. Rubber pedals are preferred for roadster bicycles, from the comparative absence of vibration, their springy nature giving to the inequalities of the road. On the other hand, in two thin steel plates set on edge, and the edges serrated, or cut into teeth like a saw, or the jaws of a rat-trap, hence their name. They also may be coned or ball-bearing. They are used almost exclusively on racing machines, when they are made very light, running on balls, and the plates cut into sharp spikes, so the feet of the rider may not slip—a rather serious mishap in racing.

The pedals are attached to the cranks by passing the projecting ends of the pins through the slot, and screwing up the nuts firmly. The slots in the cranks allowing the stroke to be regulated from about 4½ inches to 6 inches.

There are various other forms of pedals, notably one having three rubber bars placed triangle fashion, the object being that when the pedal is at rest, or in

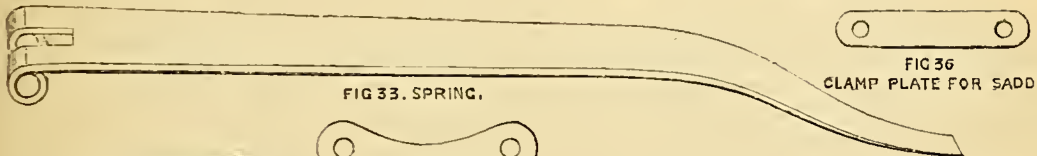


FIG 33. SPRING.

FIG 36 CLAMP PLATE FOR SADDLE

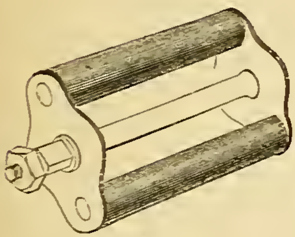


FIG 38. RUBBER PEDAL

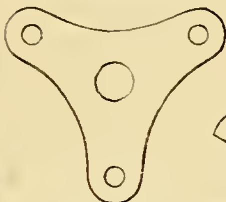


FIG 40. END PLATE OF THREE BAR PEDAL.

FIG 34 SLIDE FOR SPRING

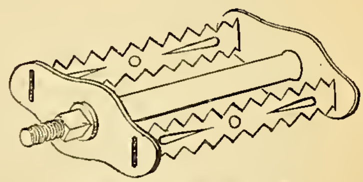


FIG 39. RAT-TRAP PEDAL.

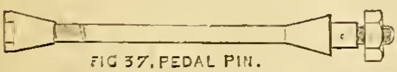


FIG 37. PEDAL PIN.

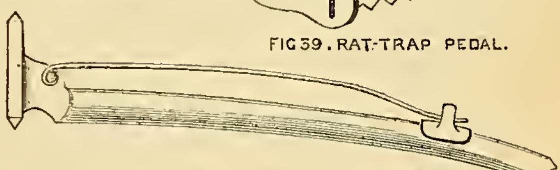


FIG 35. PART OF BACK-BONE WITH SPRING IN PLACE.

wet sloppy weather, the feet slip from rubber pedals very readily, and so in this particular rat-trap pedals are to be preferred, or, as I have mentioned, a combination pedal—one side being rubber, the other rat-trap.

A rubber pedal has two parallel bars of rubber 4 inches long, about 1 inch thick, enclosed between two end plates. The pedal pin passes through the centre, between the bars, the pedal revolving freely on the pin by means of a cone at each end, or the pedal may be a ball one, in which case a row of steel balls takes the place of the cones, and are a great improvement over the latter, from the ease and freedom with which they revolve.

A pair of good rubber coned pedals may be bought for 5s., and while all the separate parts may be bought ready for making up, I should advise the amateur to buy the pedals complete, as the cheapest method.

In rat-trap pedals, the rubber bars are replaced by almost any circumstance, two of the bars will present themselves ready for the foot at all times.

Fig. 37 is the cone pin for pedal, showing nut for attachment to crank; Fig. 38 is a rubber pedal; Fig. 39 is a rat-trap pedal; Fig. 40 the end plate of a three-bar pedal.

Having now noticed all the parts that go to make up an ordinary bicycle, it may be mentioned that the rider is not completely equipped without a hub lamp. This is suspended inside the large wheel to the hub, being constructed to fit on to that part of the machine. A tool bag is also a requisite. It is suspended over the spring immediately behind the saddle. Its office is to carry an oil-can, bicycle wrench, etc.

Now the amateur mechanic having completed his bicycle, it will be necessary to do something in the way of painting, or if it has been finely finished, all bright, it may be kept so, but only at the expense of a good deal of elbow grease. If the fancy goes that way,

certain parts may be plated, such as fork-head and break, handle-bar, spring, hub, cranks, etc. The rest painted any suitable colour, such as black, dark blue, chocolate, etc. On the other hand, as amateur mechanics generally don't come well out as painters, it would be a good plan to give it out to a regular machine painter, or to a maker to be done in Harrington's enamel, which is acknowledged to be about the best thing yet known for the purpose.

(*Concluded.*)

FISHING TACKLE:

ITS MATERIALS AND MANUFACTURE.

By J. HARRINGTON KEENE.

II.—KNOTS—GUT, HAIR, AND GIMP.

THE average Briton is a bad hand at cordage, but there are several ties and knots the learner of tackle-making *must* be master of before he can hope to put a length of gut or gimp together properly. It will fall to his lot to chiefly tie gut, and often this is so fine as to require the minutest care in such joining. In all cases the gut or hair to be tied should be soaked in warm water. I have found that the addition of a little glycerine to the water is beneficial with the coarser kinds of gut, as it seems to keep it moist and soft longer than water seems to do, especially if it be hard. The bath should not be continued too long, as it is apt to injure the texture of the hair or gut. Gimp is not usually knotted, but whipped when a join is necessary. Of course, however, it is tied to the running or reel line, and Figs. 21 and 22 show two methods of doing this.

A in both figures indicates the running line, and B is the loop of the gimp trace. The figures themselves explain the mode of tying. Fig. 21 is an extremely useful tie, and only requires the application of the teeth to C, and it instantly becomes free, though under no circumstances will it "draw." In all these knots it is eminently necessary that the tyro should take pains to tie them by the drawings—in fact, to learn them before he proceeds further with my directions.

Fig. 23 shows the cloven hitch, which is used as a fastening-off in hook-tying and whipping generally. In fly-tying, as a final tie, I, myself, use nothing else, though others do so. A cloven hitch is always secure, and if it be deemed that extra safety is needed, it may be repeated.

In Fig. 24 we have the true "Sailor's Knot," and as it is easily tied, and when the ends are neatly whipped in as secure as any, it is not surprising that it is exceedingly popular, especially amongst amateur tackle-makers. Everybody, of course, knows how to tie it, but I am justified, by my own experience, in adding one word of caution: be very careful when you do tie it to see that the two short ends at A A are both on one side, and not, as in Fig. 25, on different sides. I recollect in my noviciate that I repeatedly made this mistake; and, as sure as fate, whoever fished with the gut tackle I made lost his fish sooner or later. And why? Because Fig. 25 *will draw.* A and A are on separate sides. I have more than once defied even good cordsmen to tie the knot off-hand; in fact, like Isaak Walton, I am fond of a "good catch," whether of fish or humour, and it has immensely amused a company of anglers before now to find me challenging them to tie so simple a knot as Fig. 25. "A Sailor's Knot it is," they have said, "and it will never draw.' "It is not a Sailor's Knot," I have retorted, "and it will draw; examine it again, my good friends;" and with that someone has pulled it tightly, and so gradually drawn it. "Now," I have said, "you all saw the knot, and saw it draw. I challenge anyone to tie it again so that it draws," and immediately someone has tied Fig. 24. And so the mystification has gone on to the verge of irritation, when the explanation of the position of the two ends has settled the affair.

Fig. 26 is termed the "Fisherman's Knot" by most writers on fishing, and I admit it to be an exceedingly useful one for the attaching of flies, etc. It is easily made, and when drawn tight is very neat. Its only fault is that it is apt to draw itself so tight under a strain that it cuts or crushes the material of its own-self, and thus on striking a good fish Piscator finds himself minus gut, hook, and fish. For this reason it is unfit for connecting the links of gut in a fly-casting line, which would contain, perhaps, fourteen or fifteen links; for the gut on drying shrinks, and often becomes brittle just where this knot has strained it. Fig. 27 is a much better knot. There are fewer convolutions, and hence fewer bearings where the strain falls. It never contains an approximation to an angle, no matter however tight it is drawn, and it is therefore much preferred to Fig. 26 on that score.

Fig. 28 is a knot which, though a modification of the preceding, is so exceedingly secure and neat when properly drawn tight, that I unhesitatingly pronounce it the best in the repertoire of the tackle-maker. It is tied by first forming the knot Fig. 27, and then turning the ends again round and through. In fact, it is a double Fig. 27 simply. Of course, as I before insisted, the gut must be well soaked, and the ends must be drawn absolutely tight. The short ends can then be snipped off as close as you choose. Fig. 29 shows loop made on the same principle, and Fig. 30 is also a double of its predecessor. The whole of my remarks relating to Figs. 27 and 28 apply to these, of course,

taking into consideration the difference in form. A loop tied like Fig. 30 is therefore the most secure and neatest of any.

Of course, there are other ties and knots than those given, but these are the chief; and in my experience, which both as an amateur tackle-maker and an angler, has extended over many years, they are the best. It is true that Fig. 28 is not suitable for splicing a line which is long, and when the long and short end can be passed through the loop together. In such cases the excellence of the Fisherman's Knot is apparent To tie that, all one has to do is to put the ends, about 3 inches, overlapping each other. Now take them firmly by the middle of their overlapping between the finger and thumb of the left hand. Now pass one short end round the line and through itself, then turn to the other short end and do likewise; pull the short ends tight, and draw the two knots thus made together tightly. There is another tie of this nature besides the Sailor's, which ought, perhaps, to find place here, and it is one that I have always known as the Weaver's. Fig. 31 shows its form, and it will be seen that it is a modification only of Fig. 22. The knots at the short ends are necessary, because water is a great predisposer of slipping or drawing, and though it is possible that the silk line might not slip, there is no surety that the gut or hair might not if this precaution were neglected. Fishing is largely composed of precautions and preparations, so it must not be surprising if I am found very precise and minute in this particular. Fig. 31, I think, explains itself.

In Fig. 32 we have a knot of a most useful character. It is a double Fisherman's Knot, and is also useful for the joining of gut casts when broken, or, in fact, of any line in a similar condition. A simply indicates the method of attaching a fly at right angles inside the knot in question, so that when B B are drawn together, the dropper, as it is termed, is practically immovable. This knot is used by fly fishermen in preparing gut casts with several flies on them before starting for the water-side. It is rather intricate to tie, but I see no insuperable difficulty.

I suppose I need scarcely tell my readers that for the line nearest to the hook, gut, hair, or gimp is always employed. Some years ago, indeed, and even now in some old world localities, a kind of Indian weed—of which I have samples before me—were used in preference to either gut or hair. This weed is certainly strong, and might serve as a substitute, but I can certainly not place it above gut or hair for invisibility or durability. So late as 1760, however, Professor Rennie, in his notes to an edition of Walton, recommends it in preference to either of these materials; but the writers antedating even Walton, very rationally, I think, prefer the production of the stallion to any other, except gut, of course. In ancient times it is probable that a kind of byssus constituted the hook lines of the native fisherman. With the genesis of these things we have not to deal here, and I shall therefore pass on to a few remarks on the manufacture and nature of silkworm gut as in use among anglers of to-day.

Though Best, in his "Art of Angling," figures a queer frame-like machine on which, we are informed, the gut is stretched, I doubt if one angler in ten, reading the book, really understands what the drawing means; in fact, until comparatively recent times, the Spaniards, from whom the best gut came, enjoyed almost a monopoly. British enterprise, however, has terminated this; and at the time of writing several English firms have established branch houses for the collection of the worms and the manufacture of the article. Messrs. Allcock, of *Redditch*, have a large manufactory at Murcia, and I have in my possession a splendidly-executed photograph of the *employes* and the house assembled *en fete* to welcome the proprietor. Not daring to trust my memory as to the details of gut manufacture, I applied to Mr. R. Ramsbottom, of 81, *Market Street*, *Manchester*, for particulars, and his kind reply runs as follows: "Silkworm gut is manufactured chiefly at Murcia, in the south of Spain, situated in a rich and fertile valley abounding in all kinds of fruits. Murcia is an ancient city, formerly a Moorish town and a considerable number of the inhabitants of to-day are descendants of the Moors. For a distance of twelve miles round Murcia the peasants cultivate the silkworm, feeding them on the mulberry leaves which are most plentiful.

"About the beginning of May the worm is taken and plunged into hot vinegar, and after remaining there for a few hours the workmen slough off the body from the intestine. The latter is then stretched out, and the ends wound round a pin to dry." [I presume Mr. Ramsbottom means that the viscera or silk sac is stretched between two opposite pins.] "These threads are then gathered together (all sizes being mixed), and in a few days they are ready for sale.

"The gut is sold in this state by the pound weight, and is purchased by the gut manufacturers. The first process to which it is subjected is that of being put in a bath of soap and soda when the outer skin or scale comes off. It is then laid on rods, and hung up in a room to dry, and thereafter placed in an oven for the purpose of bleaching. After this it is given out to girls, a number of whom, sitting on low stools, take a quantity in their laps and puts separately each fibre between the teeth, and rubs it with a wash-leather. Each girl at night wraps up her work in a clean cloth, to which her number is pinned, and she is paid each night so much per thousand. Next day she

takes the same roll of gut and sorts out the various lengths and thicknesses. She then again rubs each strand with washleather. After this it is passed to the men, who tie it up in lengths of one hundred each, and wrap the tails with a coarse red thread."

Thus far, the concise and succinct description of a very large manufacturer. I may add that the silkworm is deemed ready for the process just when it leaves off eating, and a greenish thread is seen protruding from the mouth. Whether or not it would pay to breed the worms for the purpose in England or not, is a matter for other heads than mine. Of course, the gut when it reaches England is of a brilliant white pearly hue—just the worst appearance conceivable on a bright clear stream. It is, therefore, stained of a bluish-green or other colours, according to fancy. Some anglers like a faint green, others a brown, others a yellowish, and so on; and I here propose giving a few approved stains for gut and horsehair which will not only achieve the desired hue, but be also fairly innocuous—by this I mean that I have not found them to accelerate the rotting of the gut. Judson's dyes are capital for some class of feathers, but I cannot recommend them for gut because of their strong, and in some cases corrosive, nature.

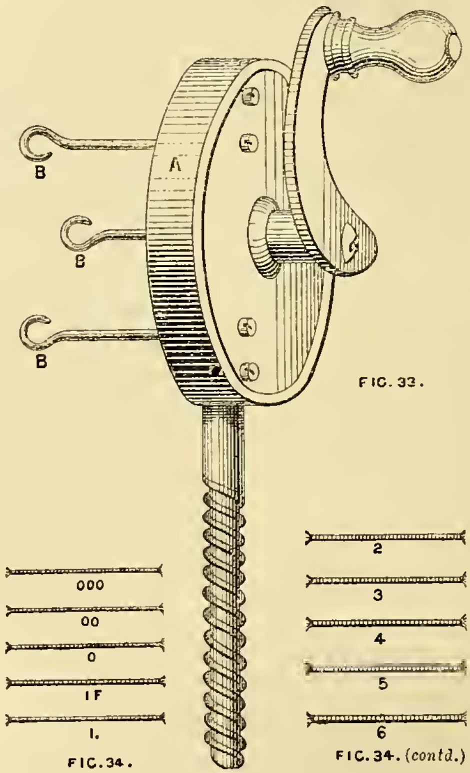


FIG. 33.—APPARATUS FOR TWISTING GUT.
FIG. 34.—GAUGES OF GIMP.

Light Yellow or Amber.—3 scruples quercitron bark, 2 scruples alum, 2 scruples cream tartar, 12 grains madder, 8 drops saturated solution chloride of tin. Immerse three minutes, and dry in warm room. Another: A handful of common barberry tree, and let the gut remain in an hour or two, and dry.

Green, Colour of Water Weeds.—Boil gut or hair in solution of alum to get rid of the grease, then in a solution of indigo, with sufficient turmeric to get the exact shade. Another: A strong solution of green tea; put the gut in when the tea is very hot, and let it remain till the desired shade is obtained. Another pale water-green is thus obtained: Half pint strong ale, ½ lb. of soot, a little piece of alum, and a few walnut leaves. Boil these together half an hour, and immerse the gut. Another: Two quarts of strong alum water (handful of alum to quart of water) and a good handful of marigold leaves; boil till a yellow scum arises. ½ lb. green copperas, and ½ lb. ordinary verdigris, pound them, and mix. Put in the gut or hair, and allow it to remain three or four hours. A bluish-green stain can be made from green baize. Boil a piece of same three or four inches square, with a good knob of alum, for three or four hours; if the dye be wanted of a deeper colour, add some writing ink. This latter alone, by-the-bye, makes a good stain. For brown, good French coffee makes a capital stain. Let the gut remain in some considerable time.

I have said that the gut is of the wrong colour when it arrives; it may also be added that until quite recently it was almost impossible to procure it fine enough for trout and other fishing in clear streams. Even now the finest gut is a very high price. Resort is, therefore, made to a process termed "drawing"—although it must freely be confessed that "drawn" is not nearly so strong as the "whole" gut. A machine, very much on the same principle as that used for drawing wire, is used for this purpose. I, however, prefer a different procedure, which has, at least, the advantage of simplicity. Dip the gut in vinegar and water, and, having wetted the finger and thumb with this, rub them up and down the gut until sufficient of the substance has been frayed off. Then dip the gut again in clear water (to wash away any traces of the vinegar), and after it is dry take an end of each between the teeth, stretch it tight, and polish with a dry washleather.

Some of the best salmon and pike traces are made from twisted gut; in fact, they are becoming very fashionable, and reasonably so, as gut is so much more transparent and durable than hair. Nor is twisted hair to be despised in the absence of gut. Fig. 33 represents the gut-twisting apparatus. The slightest knowledge of mechanics will exhibit its internal mechanism. The box, A, contains three cogs corresponding with the hooks, B, B, B, and these, in turn, are moved by a cog connected with the handle. The box might be made of wood or brass, and the rest of the works easily put together by anyone handy with metal-

working tools. Of course, the twister is fixed rigidly to a solid bench or table. The hairs or gut are manipulated by the left hand, whilst the right turns.

Hair is, of course, of a much different texture to gut, and of a totally different nature, inasmuch as it is homogeneous and slightly tubular. Moreover, it is distinctly elastic, which gut is not, and it is on this account that it is sometimes preferred to the gut. The best hair is obtained from a stallion, or, if possible, thorough bred, and it should be from a grey horse. I have some now which was plucked from a famous horse in Hampshire, and some of its strands will actually bear a dead weight of two pounds. Of course, there is plenty of gut that will beat this, but I mention the fact as being in itself very extraordinary.

It is always desirable for the tackle-maker to keep a good store of hair for the reason that even if he does not make up roach and dace hair-hooks and lines or fly casts, he will now and then find a thread of some particular colour will exactly match a smooth-bodied fly, perchance. More of this, however, in the section devoted to fly-making.

Gimp consists of a fine unwoven silk cord surrounded by coils of brass wire. Its colour is either that of silver or brass, and when in this state is, of course, extremely visible in the water. It is used in the manufacture of flights for jack fishing in all its branches, and as such is an extremely important item in the material-basket of the amateur manufacturer. The engraving (Fig. 34) shows the gauges of this article, and according to these, it can be ordered from any tackle-maker, or direct from the wholesale makers, Messrs. Allcock, of *Redditch.*

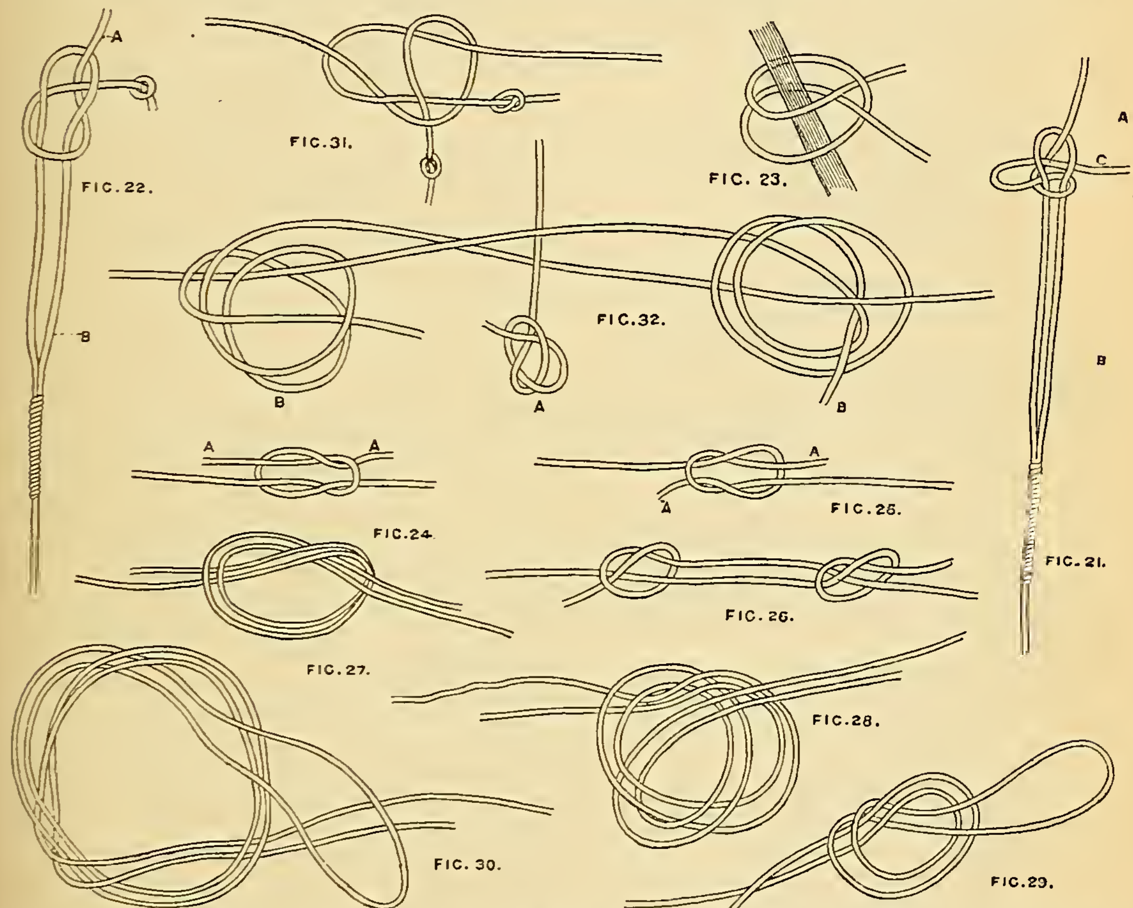


FIG. 21.—ATTACHMENT OF GIMP TO RUNNING LINE. FIG. 22.—ANOTHER MODE. FIG. 23.—HITCH USED IN FASTENING OFF IN HOOK-TYING. FIG. 24.—TRUE SAILOR'S KNOT. FIG. 25.—FALSE SAILOR'S KNOT. FIG. 26.—FISHERMAN'S KNOT. FIG. 27.—IMPROVEMENT ON FISHERMAN'S KNOT. FIG. 28.—BEST KNOT FOR FISHING-TACKLE MAKERS. FIG. 29.—LOOP ON SAME PRINCIPLE. FIG. 30.—SAFEST AND NEATEST LOOP AND KNOT. FIG. 31.—WEAVER'S KNOT. FIG. 32.—DOUBLE FISHERMAN'S KNOT—A, MODE OF ATTACHING FLY AT RIGHT ANGLES INSIDE KNOT.

To obviate the visibility referred to in all gimps, a solution of chloride of platinum, one to twenty parts of water, has been advised. My own plan is to coat the gimp with blacklead, and then varnish it. The appearance is certainly not so good in the latter case, but it is certainly cheaper, and does not rot the silk, which the chloride is very apt to do. A very weak solution of nitric acid also produces a good bronze colour, but it must be applied on a rag dipped very slightly, as I need not remark that the acid is highly corrosive.

(*To be continued.*)

HOW TO MAKE A BERCEAUNETTE PERAMBULATOR.

By A PRACTICAL CARRIAGE BUILDER.

III.—FILING UP AND TEMPERING SPRINGS—MOUNTING OR HANGING PERAMBULATOR—HANDLES.

OUR springs are now ready to fix, all but filing up, and perhaps hardening, or tempering as it is called. This process is scarcely necessary for a perambulator, and is also rather a delicate matter for an amateur, for even a regular smith requires to be practically acquainted with the different classes and characters of his steel, as well as the qualities of each, to perform this properly. I will, however, give the generally adopted process, for the benefit of any who may wish to try the experiment, and wish them every success.

Assuming then that the steel in use is of a fairly good quality, first make up a large fire of wood or coals—for carriage springs a hollow fire is used, which is a fierce fire under a bank of coal on a forge, the fire forming a long tunnel into which the separate spring plates are put, and heated one at a time, but this being out of the reach of amateurs generally, we must proceed thus: Having made a glowing—not smoky or green—fire, large and long enough to take the whole length of the body spring, lie the spring on the top of fire on its edge; when getting hot, turn over on to opposite edge until the whole is now an even dull or cherry red, but on no account any hotter. Have ready a tub or bath of just warm water, large enough to admit whole length of spring, which, being at the heat stated, lift from the fire with a pair of tongs, and plunge the whole at once into water. When cooled, withdraw it, lay aside, and serve all others exactly the same. This is the first operation, and, if properly performed, brings all the springs to one approximate temper. Now comes the final and most delicate job. Take up one spring in the tongs, and having kept your fire hot and clear, move the spring either edgewise, or, better still, flatwise, if possible, backwards and forwards from end to end over the fire until it has attained a black heat, hot enough, but only hot enough to ignite a piece of dry firewood into flame when rubbed briskly along the spring. When this takes place properly, the whole length of the spring, then plunge instantly and altogether into the water before mentioned, and it is done, and if properly done will repay the doing.

I again repeat that at no time of making steel springs must the metal be more than a bright red heat, or it will be entirely spoiled, and at the final tempering it must be the least trifle, if any, above black heat, and when plunged into water, be sure to immerse the whole length at the same moment, otherwise your spring would be unequally tempered, and always liable to break ; and I also repeat that it is the best for amateurs, or, indeed, for perambulators made by anyone, to leave the steel for springs in the state in which it is bought.

We now proceed to mount or hang the perambulator. To do which turn the body upside down on the ground, propping it up square and steady. Having decided which shall be the front of the body—which, by the way, should always be the best-looking end, being the most in sight—draw a chalk line square across the bottomside board. Now lay on your springs, taking care to keep the line exactly where the hind axle will be when fixed, and being sure to keep the axle holes in springs exactly over this line. The outside edge of springs should be $1\frac{1}{2}$ inch or $1\frac{3}{4}$ inch inside bottom edge of body, and both springs parallel to its sides and themselves when so adjusted. Mark the bolt and screw holes with a scriber, or bradawl, take away springs, bore the holes—the bolt holes—through with $\frac{1}{4}$ inch spoon-bit, and screw holes with gimlet of suitable size. Now fix the springs, and try them, to see if square up, by placing bottom edge of a square board on bottom of body, and seeing that the springs correspond to the upright edge of the same. Should they stand a little out or in, put a small wedge of hard leather or cardboard the whole length of the bearing, outside or inside as the case requires, until they stand square and true when screwed up tight. Put the bolts through from inside, and round-headed bolts are best, as they have no sharp edges to cut the lining when finished.

Assuming we have the wheels to hand, we now find the length of the hind axle. A practical man would, of course, do this by calculation, but a simple method is to get a piece of iron rod—a common stair-rod will do, if long enough—lay this across the axle holes in the springs, and secure it with cramps. Now take the wheels and slip them on this rod, keeping the rim of the wheel 2 inches clear between the wheel and body side when in its proper position.

Holding the wheel firmly, mark the rod with a file close up to the back of the hub of each wheel; this is the exact length. The axle must be between the two hubs or naves of the wheels. Now make two other marks exactly over the holes in the springs on the rod, have your axle shut up to the outside marks, and two boltholes for ¼ inch bolts drilled in axle to correspond with inside marks on the rod. Now have the front axle shut up so much shorter, that the outside of the front wheels shall have a clear space of 1½ inch inside the hind wheels, but the spring boltholes must be the same distance apart, as in the hind axle, and, of course, be drilled equidistant from the inside of each of the front hubs. Now bolt the front ends of front springs on to front axle, screw up tight, and set both springs at right angles to axle, and parallel with each other. Lay a straightedge across the point of hindermost rivet holes, and see that the axle is perfectly parallel with it; if not, bend one of the springs up or down till both match and stand truly. Now cramp the back ends of springs on to body springs, on to the place marked in drawing, and immediately under the holes in body springs. Now turn the whole on to the wheels, and first see that the body stands level, back and front, on a level floor. If too low in front, put more bend in front springs; if too high, take some of the bend out. This can be done entirely by just altering each spring at the part where riveted or bolted on to body springs, when true in that direction; then try if it will run straight. You, of course, put the wheels on to try if level. Now mark a chalk line on the floor, quite straight, or a very level garden path, or, better still, a level pavement; this line should be at least ten feet long, and if ten yards long, so much the better. Now stand the vehicle at one end of this line with the right-hand hind wheel, about one inch inside it. Be sure the body is parallel to the line. Now gently propel forward, and notice if the wheel follows the line correctly; if so, mark the front holes in bottom springs, and rivet or bolt them on at once; if not, and the wheel runs on to and crosses the line at any point within ten feet from starting point, give the right hand, or off side, front spring a tap forward—a very little at a time will do. Then try along the line again; repeat this till it does run straight. If the perambulator runs away from the line to the left, then tap the left hand, or near side, spring forward, exactly as before, till it runs truly, then mark all holes, have them drilled, and fix in their places. Of course, the person making this trial stands at the back of the vehicle.

Having got thus far, we now turn our attention to handles. These should be made of $\frac{7}{16}$ inch round or ⅝ inch oval iron, according to the taste of the maker; and the wood cross handles should be 34 inches or 36 inches from the ground, according to height of the person who uses it. The irons can be made any sweep to suit taste, but I think the shape of H, Fig. 10, is easiest for amateurs. The top part must be flattened out and rolled up to fit the cross handle. A little foot, or flap, must be made at I, to bolt on to top of body, and the bottom ends flattened out and drilled to take ¼ inch bolt through the foundation board, as at J in Fig. 10. The handle can be turned any shape to suit taste, but should be either ash, beech, mahogany, or rosewood. The white china handles look very nice, but are easily broken, and so very cold to the hands if used in cold weather or winter time. To fix the handle, fit the turned-down ends of cross handle into the eyes of the irons, tightly cramp the bottom ends in their places, and fix with a screw in each. Set the irons up straight with the back, and push between, not through, the basket work, a sharp pointed iron rod ¼ inch in diameter, and, when fixing in their places, put a piece of hoop iron inside the basketwork, with two holes punched in to take the squares and heads of handle bolts. This strengthens the basket where all the pushing takes place, and prevents the bolt heads from drawing through and damaging the wickerwork; and fix cross handle with wedges.

I find I must make the wood wheels, the trimming and painting the subject of another paper, there being so much detail in these matters when reduced to writing, and I am anxious to make every item as clear as possible, as I do dearly like to see work thoroughly well done, whether amateur or professional.

(*To be continued.*)

THE RENOVATION OF OLD PRINTS, DRAWINGS, AND OIL PAINTINGS.

By JOHN BRION.

V.—LINING OIL PAINTINGS—RENOVATING—TRANSFERRING FROM PANEL TO CANVAS.

IN my last article I described methods for cleaning pictures that were uninjured save by age or dirt, we will now proceed to the points that yet remain to be considered, namely, lining, renovating, and transferring from panel to canvas.

Lining.—Suppose we have to deal with a picture whose canvas is decayed, bulged, or slackened, and which therefore needs "lining;" that is, to be supplied with new canvas and made even.

1. Cut the edges of the picture close up to the stretcher, so as to entirely release it. Paste clean, damp, moderately stout paper entirely over the face of the picture, and upon this paste a covering of muslin. The object is to protect the painting from

injury while being worked upon, and to keep all in its proper place, in case of any portion of the old canvas or the pigments giving way. The muslin and paper will be removed, after the lining is completed, by using a sponge very slightly wetted in warm water, and cleaned off, before varnishing, with diluted ox-gall.

2. Have ready a new stretching-frame, of the same size as the old one, with a bar across the middle of it (A B, Fig. 9), to aid in bearing the additional strain to which it will be subjected. If the picture be of considerable size, it will be well to have two bars, A B, C D, as in Fig. 10. Be also prepared with a new piece of unmounted and unprimed canvas, 2 inches larger in size all around than the picture you have in hand. Brush the back of the old canvas of the painting thoroughly, in order to remove all particles of dust and dirt ; rub down inequalities with pumice-stone.

3. Prepare a paste thus : Ordinary wheaten flour, 1 lb. ; best pale amher glue, ½ lb. Boil the glue in a clean vessel, with a pint of water, till it is entirely dissolved. Let this be done by gentle simmering ; a glue-pot is best adapted for this, but a stout marmalade jar or clean, empty tin, such as those used for preserved meats, placed in a saucepan of water and kept gently boiling, will serve the purpose well. Mix the flour with cold water till you obtain a mixture of the thickness of cream. Add the whole of the boiled glue, stirring the mixture till it is thoroughly amalgamated, and, if needed, add a little warm water to preserve the requisite consistency. Pour the compound into a clean saucepan (an enamelled one is to be preferred), gently boil over a clear, slow fire for ten minutes, keeping constantly stirred. Pour into a sufficiently large bowl or basin; add 2 ozs. of creosote, mixing this with the warm paste by thoroughly stirring them together. While the mixture is warm, take a stiff paste-brush, and with it work the paste thoroughly into the old canvas of the picture. During this operation employ a firm linen pad, with which gently and firmly press down the bulgings and smooth out the inequalities of the back of the canvas. Take the new canvas, and with the paste and brush go over one side of it exactly in the same manner as you treated the back of the picture, sedulously rubbing the paste into the grain of the canvas. Too much attention cannct be paid to this operation, as on its completeness depends the even and perfect adhesion between the old and new canvases, and the consequent success of the work.

4. Get some one to assist you ; then take the new canvas at each corner and lay two of them upon corresponding corners of the back of the painting. Let the new canvas very gradually drop upon the old, and be especially careful that no wrinkles or folds occur. Rub the back of the new canvas very firmly and evenly with a stout ball formed of felt or cloth, so as to cause complete adhesion. Some picture-restorers employ warm irons similar to those used by tailors. We do not recommend the practice, for in inexperienced hands the irons, over-warmed, may be fatal to a picture ; a careful rolling (using for the purpose a well-cast glass wine-bottle) will effect all that is needed. After the rolling, place the picture in a common towel or other press, retaining the blotting-paper as a bed for the face of the painting. If the work be too large, or you cannot command the use of a press, let the picture remain on an even table; cover the back of the new canvas with smooth board, weight it heavily with books or any other available articles, and let it lie thus for about two hours, then remount it on the stretching-frame. Gently drive in the keys of the stretcher (E, F, G, H, Fig. 10) till the surface of the picture is even ; let it remain three or four days in a dry and moderately warm room, when it will be ready for cleaning, further repairs, or varnishing.

Note.—I recommend pale glue in preference to the dark-coloured glues in making the mounting-paste, as frequently, in lining, the paste penetrates through the old canvas, and exhibits itself in a gloomy tint through the colours of the painting, entirely changing the original tones of the work. This is painfully exemplified in "The Raising of Lazarus," by Sebastian del Piombo, in the National Gallery—once a glorious assemblage of colour, now a gloomy miracle of drawing, rendered thus by the glue, etc., used during the process of transferring the picture from panel to canvas. The creosote is introduced to prevent the breeding of worms in the paste, which would otherwise occur. Corrosive sublimate of mercury, or ox-gall, used in the same proportion as that given for creosote, may be used as a substitute, if desired.

Repairing of Damaged Canvas.—Not infrequently a hole or rent has been made in the canvas of a painting that is sound in its other parts. Lining is not needed here.

1. Lay the picture, in such a case, with its face downwards, upon a smooth board. Place a piece of new canvas, a little larger than the rent, over the damaged part ; dust powdered gum mastic or best shellac evenly between the old canvas and new piece ; apply a very warm flat iron to the new patch, in order to melt the powdered gum, and, if properly done, the union will be perfect, and show no trace on the face of the picture. Avoid using glue or paste, or the new piece will bulge, and thus be a disfigurement to the work.

2. Occasionally we have pictures with damages so peculiar and complex as to render the *insertion* of a new piece of canvas desirable. In these cases, cut

out the damaged part; take a tracing of the hole A, Fig. 11. Line the picture, if needed, by the methods already explained; or, if lining is not required, fit a new piece of canvas to the back of the picture so as to cover the area between the dotted lines B C, C D, D E, E B, Fig. 11. Attach this by the plan named in the foregoing paragraph.

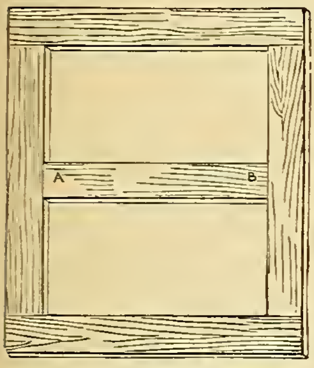


FIG. 9.—LINING STRETCHER WITH ADDITIONAL BAR.

When the lining is perfectly dry, or the patch of new canvas is satisfactorily fixed, select a piece of canvas of the same texture and substance as that of the picture, and guided by your tracing, cut a portion that will exactly fit the hole A, taking heed that the threads of your new piece run horizontally and vertically to coincide with the texture of the painting. Liberally dust the place wherein the piece is to be inserted with your powdered mastic, fit in your new piece; apply the warm iron, avoiding, as far as possible, touching any part, save that under repair; cover the place with a heavy weight for an hour, and if the work be well done, no stopping around the edges of the recent hole will be needed, if any imperfection occurs in the fitting of the piece it may be remedied when the repairing of the pigments are in hand, of which we shall speak presently.

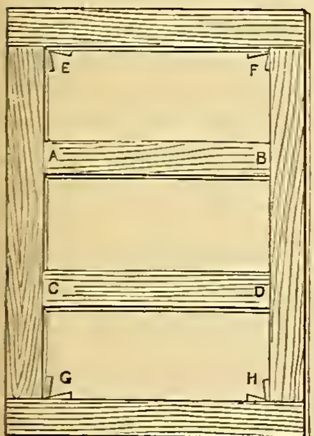


FIG. 10.—LINING STRETCHER WITH TWO BARS.

Transferring from Panel to Canvas.—This is the most difficult process in the art of picture re storing, and should never be undertaken by the amateur (in connection with valuable works), without considerable practice upon unimportant specimens. Suppose such practice to be obtained:—

1. Cover the face of the picture with paper and muslin, an inch or two wider than the panel, as already recommended, and fix it firmly, face downwards, to a bench or table. With a sharp scraper, broad chisel, or very keen-edged plane gradually remove the wood of the panel; a good rasp is also very serviceable at times. The utmost patience and caution are required in this operation, for, as the chief reasons for transferring from panel to canvas are the depredations of rot and worms, the wood is so fragile that the slightest error may send the picture into irreparable fragments. But patient "labour overcometh all things." I have found it very safe to surround the panel, before commencing the planing, with a low, broad, wide frame of deal, which can be gradually bevelled down to the edges of the picture as the task of removing the panel approaches completion. When this stage of the work arrives a double amount of care is needed, or one unhappy stroke will send your plane or scraper through the paint, and thus ruin all. I reiterate: Be patient, be wary, and these, aided by the excellent tools that are advertised in the pages of AMATEUR WORK, and a *quantum sufficit* of tact, will enable you to lay bare the back of the pigments that form the picture. Clean this with diluted ox-gall, and mount on canvas in precisely the same manner as that described in the paragraph on lining.

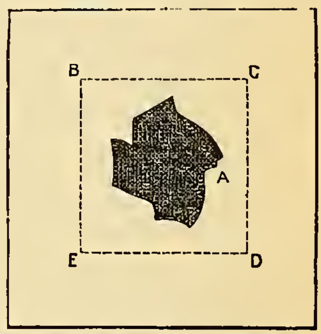


FIG. 11.—METHOD OF INSERTING A PIECE OF NEW CANVAS IN PICTURE.

Panel that has been only slightly attacked by worms may be preserved from their further ravages by scraping the back of the wood very clean, and then brushing it over with a liberal application of creosote or corrosive sublimate, taking care that the remedy soaks well down into the orifices formed by the invisible enemies. Rot may be oftimes arrested, or a weak panel be materially strengthened by repeatedly soaking the back with copal varnish much diluted with spirits of wine. Bulged or indented pictures on copper may be levelled by placing them under a powerful press. If you cannot command one, apply to a bookbinder, who for a sm fee will effect what you require. On no account resort to hammering the bulge or dent. Percussion will almost surely cause the starting of some portion of the painting from the metal. Oxidation of copper generally manifests itself by a greenish exfoliation on the surface of the picture. A generally efficacious remedy is to saturate the part affected with the diluted copal varnish which we have just mentioned.

Retouching.—Picture restorers who have some knowledge of painting, too frequently seek to brighten

the effect of their work by a liberal use of the palette; to such an extent has this been sometimes carried, that there are well-known examples in which it is believed that the original work of the artist has been entirely repainted by officious restorers. In some cases of great damage, cracking, or the insertion of a new piece of canvas, judicious stopping and repainting are absolutely necessary. If the picture cleaner is not fairly acquainted with drawing and the use of colours, we advise him not to attempt this branch of restoration; if he be fairly versed in the arts mentioned, a cement formed of stiff painter's putty, well worked up with copal varnish, will be found easy to work and very durable. In using this take care to slightly touch the cracks or other defects with varnish before applying the cement, and clean off the edges of your work as you proceed with a little turps.

In retouching or repainting any portion of your work, keep your pigments somewhat brighter than those of the original, as the new colours will gradually darken. Before proceeding to retouch, it is well to give the entire picture a slight coat of varnish, in order that the tones of the original may be clearly seen. After retouching let the picture remain some weeks before varnishing, and you will see more clearly the results of your restorations, and be able to rectify any omissions or errors that may have occurred.

Should any of my readers have any difficulty in procuring the various materials which we have mentioned in the course of these papers, Mr. George Squire, Artists' Colourman, 293, *Oxford Street, London*, will collect and transmit (without extra charge), any articles produced by the London makers.

Since writing the paper on Restoring Prints and Drawings, I have found tartaric acid, in the proportion of two drams to half a pint of water, to be a most safe and effective bleach for the removal of fly marks and general discoloration.

(*Concluded.*)

HOW PHOTOGRAPHIC TRANSPARENCIES IN CARBON ARE MADE.

By W. T. WILKINSON.

CARBON or autotype printing is based upon the fact that the gelatine mixed with a small proportion of bichromate of potash, and dried, is sensitive to light, not in the same way as albumenised paper, viz., by a visible and dense discoloration, the progress of which can be watched; but by rendering the film of gelatine insoluble in hot water. As prints made in gelatine alone would be colourless, various pigments are mixed with it. It is then spread in a thin layer upon paper, such pigments varying with the colour required in the finished print.

Paper coated with pigmented gelatine is known as carbon tissue, and is sold by the Autotype Company, 74, *New Oxford Street, London*. In the tissue made for transparencies, Indian ink in an extremely fine state of division is used as the colouring matter; but the sepia and red chalk tissues yield very fine transparencies, and form a pleasing variety to the rather heavy colour of the Indian ink. The same remark may also apply to the autotype portrait brown.

Amateurs may make their own tissues, but it is rather a complicated process, and offers no inducement in the way of cheapness, as the necessary apparatus and want of experience in the management of gelatine would absorb more than the difference between the cost of home-made and that purchased. As this paper is written for tyros who are not up in carbon printing, it will perhaps be as well to give a brief outline of the process, leaving the details until afterwards.

Carbon tissue is sensitised by immersion in a solution of bichromate of potash, and dried. It is then cut up into sizes about quarter of an inch larger all round than the size of picture to be printed.

The negative from which the print is to be made is provided with an opaque mark, the opening in which being large enough to include all the subject required. It is then placed in the printing frame, and a piece of the sensitive tissue laid in position, black side in contact with the face of negative, the tissue to be quarter of an inch larger all round than the opening in mask, so that the extreme edges of the tissue are quite protected from the action of light, this portion of the tissue being called the "safe edge;" and its necessity will be explained further on. The frame being closed, it is exposed to light; and as the progress of printing cannot be watched as in silver printing, the duration of the exposure is timed by means of an actinometer, a small cubical box containing a strip of sensitised albumenised paper. The print being exposed, it is removed from the frame and immersed in clean cold water, then placed in contact with a piece of glass (previously coated with a thin solution of gelatine), and lifted out of the water. An indiarubber squeegee is now used to expel the air from between the surfaces, when the tissue, like a boy's leather sucker upon a smooth stone, will adhere firmly to the surface of the glass plate. This operation being called mounting the exposed tissue After allowing the mounted print to stand a few minutes, it is placed in a dish of hot water at a temperature of 100° Fahr., and shortly the black pigment will commence oozing out from the edges of the paper backing, and in a little time longer this backing

is lifted entirely off and thrown away. The dish is now agitated, and in a few minutes the unaltered pigmented gelatine is dissolved away, leaving the image upon the glass. It is now rinsed in cold water, when it may be stood away on a rack to dry. Such is the process in brief, and we will now proceed to working details, and, first of all, describe the necessary appliances, which are: Tbe actinometer, costing 2s. 6d.; the indiarubber squeegee, glass plates about 2 inches larger all round than the pictures to be put upon them. Waste dry plates can be used for this purpose. A tin tube for storing the sensitive tissue, and protecting it from the action of light and damp. The printing frames required are those provided with plate glass front, and to prevent the tissue cockling whilst printing in damp weather, it is as well to provide a piece of American cloth instead of the usual pads. Tbe materials comprise carbon tissue, bichromate of potash, liquor ammonia, and a 6d. packet of Nelson's gelatine. There will also be required two or three tin dishes, about 16 inches by 13 inches, for the various operations of sensitising the tissue, and mounting and developing the print.

Of the above, the actinometer is tbe only piece of apparatus requiring special notice. In form it is a small cubical tin box, provided with lids close together, and in body of box a small roll of sensitive albumenised paper, one end of which travels between the two lids, and projects outside tbrougb a slit made for the purpose. The outer lid is fitted with glass upon which (with the exception of a small oblong aperture left clear) is spread a coat of oil-paint, the colour assumed by albumenised paper after exposure to ligbt.

Now to understand the use of this instrument, select a negative of fair average density, and place in a printing frame with a piece of sensitive albumenised paper in contact, and expose to light simultaneously with the actinometer. Now if the light be at all bright, tbe small portion of the sensitive strip under the slit in actinometer will speedily discolor, and as soon as it does so to the tint of the pigment surrounding it, one tint is registered. Now pull tbe strip forward so as to expose a fresb surface under the slit, which in time will be discolored to tbe same tint as the last, when two tints are registered, and so on until it is found that the albumenised paper under the negative has been printed to a proper depth.

Now suppose that during the time required to get the albumenised paper under the negative printed to the proper depth that four tints have been registered by the actinometer, then mark that negative four, and from it you can judge other negatives, whether they require less or more; and when they come to be printed in carbon, mark them accordingly; but bear in mind that for transparencies a darker print is required than for pictures upon paper to be viewed by reflected light, and tbat it is always best to err upon the side of over than under exposure.

Drying the sensitive tissue is the most delicate operation in the whole process, and it must be conducted in a room well ventilated, and from which white light can be excluded. Provided the domestic powers will allow it, no place is better adapted for this purpose than the ordinary kitchen, providing there is no gas burnt during the operation, else the products of combustion will set up spontaneous insolubility, and the tissue is useless. To support the tissue during drying there is nothing better than a tall clothes-horse covered with a sheet of clean brown paper, or failing this, a clothes-line stretched across the room, and a sheet of brown paper across this.

It may be mentioned that the Autotype Company supply to order half bands of tissue sensitised ready for use; and as it will keep from three to four weeks in a calcium tube, for amateur work this is much to be recommended as doing away with the bother and anxiety attending home sensitising without proper facilities. The sensitising solution is composed of bichromate of potash, 1 ounce; water, 20 ounces; liquor ammonia, 10 drops; dissolve and filter.

Cut the band of tissue in two with a small tenon saw, which will give two rolls each 15 inches wide, and from one roll cut a length of 4 feet. Now fix a glass rod across one end of a tin dish, either by making two holes near the top, or tying it in position by string passed round the rod and under the dish.

All being ready, place the dish upon the floor and pour into it the solution of bichromate of potash, and place in it the 4 feet roll of tissue, and at once commence to unroll and re-roll at the loose end, taking care to keep the surface of tissue under the solution. When the whole of the length has been unrolled, repeat the operation as rapidly as possible, doing the same for about two minutes. Then place the face of tissue in contact with the glass rod, and seizing the ends with the two hands slowly lift from the solution, keeping the surface against the glass rod so as to equalise the flow of the solution. Now place it face up upon the brown paper upon the clothes-horse, and leave it to dry, which ought to be done in from six to eight hours. When dry roll it up, and place in a tin tube at least twelve hours before using it.

The plates upon which the prints are to be developed must be thoroughly cleaned and coated with a warm solution of gelatine, ½ ounce; bichromate of potash, 5 grains; water, 10 ounces; dissolve this in a clean pyro bottle placed in saucepan of hot water, and carefully filter before use. When the

plates are coated, place in a rack to dry, and when dry expose to the action of light for three or four hours, so as to render the coating of gelatine quite insoluble ; as these plates so prepared improve by keeping, a good stock of them may be prepared at one operation. Spoilt dry plates are first freed from the film by immersion in a strong solution of soda, then cleaned with a piece of rag, and washed under the tap, afterwards after soaking in a little weak acid and water are again cleaned with a rag, rinsed under the tap, and coated with the warm gelatine whilst wet.

The negatives from which the prints are to be made will require a mask. For instance, suppose a half plate negative is to be printed from, procure a printing 8½ inches by 6½ inches, with a plate glass front. Cut a piece of orange paper the size of the plate glass, and in the centre of this cut an opening 6 inches by 4¼ inches, place the negative in the frame, and place the mask over it. Now get into position, remove the mask, and hold it there until fixed by means of a little gum paper, which will prevent it from slipping out of position. Again replace the mask, and the negative is ready for the tissue, which should be at least 7 inches by 5 inches, and placed in the frame so that the opening in mask is in the centre of tissue. A mask arranged thus serves the double purpose of providing a safe edge for the tissue, and a clean margin for the transparency.

If the whole of subject in the negative is not required, then a frame the same size as the negative will do, the portion required being surrounded by a mask such as are sold by the photographic dealers. If the transparency has to be a vignette, then no mask is required, as the vignetting will furnish a sufficient safe edge. This safe edge is absolutely necessary, as unless the edges of the tissue are unexposed, the tissue will wash up from the glass during development.

When the frames are filled, they are exposed to light simultaneously with the actinometer for the number of tints that the experiment with that instrument, and the piece of silver paper has shown that the test negative would require. The exposure of the tissue being effected, remove from the frames, and provide each with a suitable piece of gelatinised glass.

About half fill a dish with clean cold water, in which immerse a piece of exposed tissue, and its attendant sheet of prepared glass. See that no air bubbles are upon the face of tissue, as if so, they must be removed by rubbing the surface with the fingers. The tissue will now curl tightly inwards, but in a few minutes this curl will relax, and if allowed to stay in the water would soon commence to curl the other way, and would be spoilt, therefore, soon after the curl begins to relax, place the face of tissue in contact with the glass plate, and adjust it in the centre. Now lift the two from the water and lay upon a smooth board with the tissue uppermost. Now place the two first fingers of left hand upon the edge of tissue, the thumb and remaining fingers being occupied in steadying the plate upon the board, and taking the squeegee in the right hand, proceed to give a few vigorous strokes upon the back of tissue. At once reverse the plate end for end, and repeat the squeegeeing. Turn the plate over, and run the squeegee over the front of glass, and see that there are no air bubbles between the tissue and the plate, as if there are at once immerse the plate in the water, and strip off the tissue and try again. Now stand the plate in a rack, and proceed to mount the rest of the batch in the same way. When all are mounted, about half fill one or two dishes with hot water at a temperature of 100° Fahr., and immerse as many of the plates upon which the tissue is mounted as the bottom of the dish will hold. After being immersed in the hot water for a few minutes the pigmented gelatine under the paper backing will be softened, when the paper may be stripped off and thrown away. Now add a little more hot water at 120° to 130°, and agitate the dish a little, when the slimy black mass will gradually dissolve away, leaving the picture in all its beauty upon the glass, finishing the development by pouring some hot water upon the plate from a jug so as to wash away any grit, etc., that may be there.

As soon as the pigmented gelatine ceases to flow, the development is complete: then after a rinse in cold water, the transparency may be placed upon a rack to dry. If the print is too light, it may be at once washed off as it is useless; but if over-exposed, immersion for an hour or two in hotter water, say 200° Fahr., may save the print. When the transparencies are dry, the front of glass and the margin will require cleaning, which can be done by means of a clean leather dipped in clean water, and any dirt removed by gentle friction, care being taken not to touch the picture.

The transparencies are now ready for mounting, which is done by placing a piece of ground glass in contact with transparency, and binding the two together either with paper or a metal rim. Instead of developing the print upon plain glass, dead smooth opal may be used (when the gelatinising may be omitted, as the ground surface of the opal gives a sufficient tooth); but in this case the picture will be reversed, therefore, only pictures can be put upon it that this reversal is of no account. Slides for the magic lantern are made upon portrait brown or purple tissue, from negatives that are full of detail, and rather thinner than usual for silver printing, so as to avoid getting a thick film of pigmented gelatine in the deep portions of the picture.

A DUMB VIOLIN.

AN AMATEUR VIOLINIST'S DIFFICULTY SOLVED.

By CHARLES E. STEEDMAN, Deniliquin, New South Wales.

As I daresay some of your readers have been placed in a similar predicament to myself, I think it only fair that I should do my best to help them in this difficulty if it lies in my power so to do. I am an enthusiastic lover of music, and an amateur violinist, but I have to work for my living; and in my present situation I live in the house which also contains my employer, his wife and two children. The children go to bed early, and, consequently, though I am free from 9 p.m., I cannot practise as my room adjoins theirs, and in the early morning my employer does not care to be awakened before 8 a.m., and at that time I start work, so all my available practice time was of no use to me. I muted my violin, stuffed all my available clothing against the door, stopped the keyhole, played with a loose bow without resin—in fact, I tried every method I knew of to muffle and drown the dulcet tone of my beautiful violin, after Ruggieri, but to no purpose. The other day, sitting on my bed (for it is in my bedroom I practise), and looking at my much-wronged instrument lying on my knee, the idea struck me — the sonorosity of a violin depends on the belly being hollow; if that belly were solid, the violin would only give the volume of sound of the strings alone, not intensified by the belly. The first spare moment I had, I went to the timber yard in our little town, and after a deal of fossicking I found a piece of wood I thought would suit me—a piece of clear pine, $2\frac{1}{2}$ feet long, 10 inches wide, and $2\frac{1}{2}$ inches thick, without a knot, split, shake or any other blemish. I bought it and took it home. In the evening I got a sheet of brown paper, and laying my violin on it I took a brown paper pattern of the back, and in my "dumb fiddle" I made both back and belly the same; but I altered the shape of the inner bouts so as to reduce the weight a little, taking care not to alter any essential relative distances or curves, as the right hand upper and left hand lower bouts (see Fig. 1). I placed this on the smoother side of my block of wood, and marked it out, marking also the plan of the neck, as shown; then with a cross-cut saw I cut all along the dotted lines, then having collected all my other tools—a $\frac{3}{4}$ inch chisel, a hammer, gimlet, pocket-knife and a large old file—I set to work.

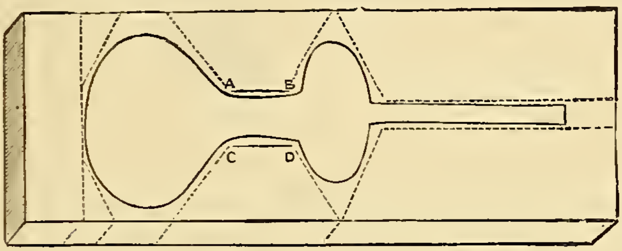


FIG. 1.—PATTERN FOR DUMB VIOLIN ON PINE BLOCK.

First, I cut out the inner bouts (save the mark) along the lines A B, C D, then laying the violin in embryo flat, cutting downwards, I trimmed all the sides right up to the pencil lines with the chisel, then setting up my violin as a model, I rounded the back and belly to correspond. Leaving an elevation at F for the rear end of the fingerboard, but without touching the neck, the back, and belly, and sides, I then smoothed down the surface with file and sandpaper. I then smoothed down one side of the prospective neck to nearly its proper position, and then I cut a piece of brown paper with scissors to correspond with the side elevation of the neck and scroll of my hollow violin. I marked this on the smooth neck, and cut away all I could with the chisel. I rounded the neck, leaving it a trifle full in breadth so as to allow for any variation in the fingerboard.

FIG. 2.—SCROLL FOR DUMB VIOLIN.

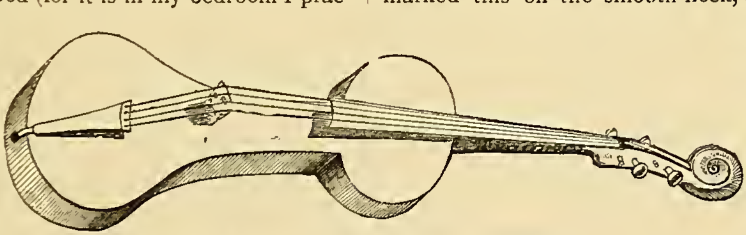


FIG. 3.—DUMB VIOLIN WHEN FINISHED.

The scroll was rather a difficulty, but by proceeding in the manner shown by the shading in the drawing, Fig. 2, I made a fair imitation of the scroll. The peg-box, then, was a difficulty; the question that arose was, whether the wood, when cut away, would be sufficiently strong to stand the strain when screwed up. I was, however, easy on that score, because if it carried away I could make two brass plates to screw on either side to take the pegs. I took my $\frac{3}{4}$ inch chisel, and burrowed out the peg-box, leaving about $\frac{1}{4}$ inch on each cheek, then I bored a hole with a gimlet

in the position for the A peg, and cautiously enlarged it with my penknife until it fitted, and so on with the other holes. I may state I first made a plan of the relative positions of the pegs, so that they would not interfere with each other when the strings were on. I found, when finished and fitted, that the A peg was a trifle too near the floor of the peg box; this I soon remedied by burring a little more away. I had a broken peg by me, and by dint of a little carving, I made it something like a tail-pin, and marking the exact half of the butt, I bored a hole here and drove in my tail-pin.

My next difficulty was a fingerboard. I went to our town musicseller's, and described my errand, and after a deal of fossicking, a violin was found that had been sat on, and had suffered in the belly in consequence. By the persuasive eloquence of the large blade of a penknife, that fingerboard was induced to part company from its body, and I took it home in triumph. I glued it on to the neck and tied it all round with string, and left it till the morning. In the meantime, I got a tail-piece, and fitted a loop of galvanized iron wire to it, got my bridge scraped down, and my strings ready. In the morning, my fingerboard was firm, I got a small piece of ebony from an old tail-piece, and fitted it on the end of the fingerboard for a nut, and gave it a lick of glue, cut four nicks for the strings, then I strung it all up, and completed my "dumb violin." I have promised it a coat of varnish, but cannot spare it long enough to let the varnish dry.

The tone of my violin, when finished, was peculiar. It sounded to me, and to two or three violinist friends of mine, as though while playing, a fly was imprisoned near their ear. I weighed it altogether when finished, and found its weight much greater than that of an orthodox violin. For practice, it is splendid; being heavier, it is much more difficult to shift on it, but when I take my hollow violin, after playing for half an hour on the dummy violin, I feel the loss of it, it seems as light as a feather. When I shut my door now, I can practise to my heart's content, and unless anyone stops and listens at my door, they can hear nothing.

I may say, for the encouragement of any one wishing to make a dummy violin, that I am not a professional carpenter or carver, but simply one who trusts to his own ingenuity to overcome difficulties, my brains helping my hands, so no one with a little perseverance, a piece of clear pine of the proper dimensions, and the few tools enumerated, need despair of making a dumb violin, if they can borrow a violin for a copy, if they have not one of their own. The whole time it took me, working about an hour at a time, was a little more than six hours.

NOTES ON NOVELTIES.

By THE EDITOR.

4. TORBAY PAINT COMPANY'S POLISH, STAIN FOR WOOD, FLOORS, ETC. 5. MOORE'S PHOTO-CERULEOGRAPH PROCESS. 6. LEWIS'S NEW FRET MACHINE. 7. THE NEW AMERICAN CHAMFERING SHAVE. 8. VELOCIPEDE FRET-SAW. 9. SKINNER'S THREE-PLY WOOD FOR FRET-SAWING.

4. TORBAY PAINT COMPANY'S POLISH STAIN FOR WOOD, FLOORS, ETC. The chief objection that can be urged against finishing or colouring woodwork by staining is, I venture to think, the number of processes that must of necessity be gone through in order to produce the required result. All amateurs who have tried their hand at this kind of work will know, and perhaps remember with a sigh, that these processes are, first, staining the wood, at least once, but generally twice, and sometimes even three times; secondly, sizing as many times; and, lastly, varnishing. Now this certainly gives a very good and brilliant result, but the surface that is thus artificially produced is one that is easily damaged, and therefore spoiled, by the slightest scratch; and, in some cases, we find, after all the trouble that has been taken, that the varnish will flake off in patches, thus causing the work to present a most unsightly appearance. At the best, the varnished surface will last but a little time, as the brilliancy soon fades; and the only way to renew its diminished lustre is by rubbing down clean and revarnishing. The combined process, then, of staining, sizing, and varnishing, although the result obtained is good for a time, cannot be considered as being wholly satisfactory; but as until very recently there has been nothing produced to supersede this plan, we have perforce been compelled to be content with it, and having nothing else, have thought it to be, from an optimist point of view, not such a bad process after all. It is indeed only after we have met with something better that we begin to recognize the demerits of processes and articles that new inventions are intended to supplant.

Now, this is exactly how the matter stands with the old staining process, which will, I think, be soon superseded by the easier and simpler mode of attaining the same end that has been brought within our reach by Messrs. Stevens and Co., the enterprising proprietors of the Torbay Paint Company, 26, 27, and 28, *Billiter Street, London, E.C.*, by means of their newly-introduced stains for wood, which they call "Polish Stains;" and as, from the specimens which have been brought under my notice, these stains are really first-class mediums for effecting the end in view, and seem to be just the thing that is wanted by those who stain their own floors and their own home-made furniture. I have much pleasure in making known their good qualities to my readers. The stains are very easily applied—one coat, indeed, is sufficient, and when dry, which they do quickly, a beautiful glossy appearance is presented to the view, thus dispensing altogether with sizing and varnishing. This glossy surface does not show scratches like the ordinary stains, because the "Polish Stains" are *perfect* stains, the

gloss being rather *in* the wood than *on* the surface, as is the case with varnish, and they show up the grain of the wood treated with them, thus rendering it the best possible imitation of the real wood that it is intended to copy.

It is an acknowledged fact that the less we have to do with carpets the better it is for health, as it is impossible to keep carpets perfectly free from dust, and when heavy furniture is placed on them, such as sideboards, etc., the parts on which this furniture stands are only cleaned, say once a year, in the domestic turmoil known as "spring cleaning," thus harbouring insects, and the causes of many kinds of diseases. A much cleaner and healthier plan, is to have a square carpet in the centre of the room, and a border from 2 to 4 feet in width, according to the size of the room, all round it stained generally a dark oak. Th has a handsome effect, and is preferable, for many excellent reasons, to the old style of covering the floor completely with carpet. When there is only a carpet in the middle of the room, it can be easily removed at any time, as the heavy furniture is at the side on the stained surface. Many persons stain the floor over, and then lay down Indian rugs or mats here and there as fancy dictates, and this mode of treatment also has a very pleasing appearance.

The use of these "Polish Stains" is most desirable for bed-rooms as well as sitting-rooms; and I wish particularly to direct attention to their value for hospitals, infirmaries, and other public buildings, on account of their antiseptic and disinfecting properties Dr. Koch, in a recent lecture on the Cholera, stated that it was far more healthy to polish and then dry-rub floors than to wash them.

An occasional *rubbing* of the stained part, which is not possible when the surface is varnished, unless some kind of lubricant, such as paraffin, be used, will not only remove all dirt, but will also restore the surface of the stain to its pristine beauty. The rubbing down of the stain is an easy matter, and should come in with the housemaid's usual duties. For the rubbing, Messrs. Stevens and Co. have introduced a "Floor Polish," a little of which put on the cloth when cleaning the floor cleanses the surface, removes scratches, and restores the stain to its original gloss. This preparation makes an admirable furniture polish, the secret of success with it being to use as little of it as possible.

The stains are made in the usual colours, namely, light oak, dark oak, mahogany, ebony, walnut, etc. They are sent out in tins—pints, 2s.; quarts, 4s.; half gallons, 6s. 6d.; gallons, 10s. 6d. Pints can be sent by parcel post for 3d. extra, and qnarts and half gallons for 6d. extra. I have gone very fully into this matter, as I know it is one of special interest to readers of AMATEUR WORK, and because I consider that these Polish Stains amply and adequately supply a want that has long been felt, though perhaps not expressed.

5. *Moore's Photo-Ceruleograph Process.*—A correspondent has kindly sent mo the directions for carrying out this "new and improved method of rapidly copying fret-work and similar patterns,' with a specimen sheet of the prepared paper that is used in its execution, and another specimen of a piece of work by following out the directions given. It is, in fact, the "Blue Printing Process," under a longer and more scientific name, but the requisites appear to be of a simpler character, and the directions more easily carried out than those which have been already described in our pages; and prepared paper is supplied at a reasonable price, which obviates the trouble of preparation on this score. The specimen sent is very clear and well defined: it is a copy of a sheet of brackets for fret-sawing, the pattern being in a pale blue tint on a dark blue ground. The requisites are a flat board covered with a layer or two of paper or cloth, a piece of glass of the same size as the board, a bottle of medium for rendering patterns transparent, which medium is composed of equal parts of castor oil and turpentine mixed together, some prepared paper, which is sold at 3d. per sheet, measuring 22 inches by 17½ inches, 2s. 6d. per half quire, and 4s. per quire, and plenty of clean cold water. Directions with three sheets of prepared paper are supplied post free for 1s. 1d., by Mr. J. W. Moore, 39, *East Street, Chichester.*

6. *Lewis's New Fret-Machine.*—The annexed illustration is inadequate to give a really good idea of a most useful fret-machine that has been constructed and recently introduced by Mr. J. Lewis, Mechanical Engineer, etc., 37, *New Oxford Street, London, W.C.*, opposite Mudie's Library, which, I suppose, everybody knows. It will, however, enable the reader to get a general notion of what it is like, especially when viewed by the description of its dimensions, etc., that I will proceed to give. That it is at once a comprehensive and most powerful machine will be apparent when I say that by its aid a fret-saw can be set in operation that will cut wood an inch thick, a circular saw driven that is 6 inches in diameter, and is contrived to rise and fall flush with the table, and a vertical drill worked that is suitable for drilling oles in brass and iron, as well as in wood. It is, in fact, a very compact and cheap machine for the amateur's workshop, doing the various kinds of work that I have mentioned above, and the price being no more than £3 17s. 6d. It is, I believe, the only machine of the sort that will cut through wood 1 inch in thickness. The height of the table from the ground is 3 feet 4 inches, and its standing space, 2 feet by 1 foot 6 inches. The machine, as may be seen, is supported on a stout pillar rising from a tripod, the length of the arms that carry the fret-saw is 16 inches; the dimensions of the table, 18 inches by 17 inches, and the diameter of the flywheel, 13½ inches, and its weight, about 30 lbs. The entire weight of the machine is about 90 lbs.

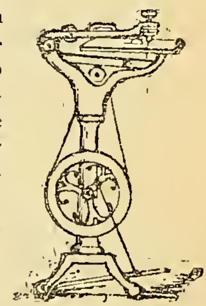


FIG. 1.—LEWIS'S NEW FRET MACHINE.

7. *The New American Chamfering Shave.*—This is a new tool of the spoke-shave class, a specimen of which has been sent to me by Mr. A. S. Lunt, American Tools and Machinery Depot, London and Sheffield Cutlery, Saw and Edge Tool Warehouse, 297, *Hackney Road, E.* It is of American make, and possesses improvements in construction, which render it superior to any tool of a similar kind intended for a similar purpose that has yet been introduced. As may be seen from the illustration in Fig. 3, it consists of an iron frame, pierced in the centre to receive an 1½ inch cutter

and iron, and on either side of the central slot with holes to admit of the thumbscrews used to slacken and tighten the guides by which the action of the cutting iron may be regulated to any desired width up to $1\frac{1}{2}$ inch. It may be used by any one who cannot manage the stop chamfer plane, and is preferred to the last-named tool. Its price is 2s. 3d., and will be sent post free to any applicant in the United Kingdom for 3d. extra. I notice that Mr. Lunt has added to his stock of tools a new kind of gauge, known as the "New Registered Gauge," wi a self-fastening stem. I have not yet had the pleasure of handling one, but I must do so, and report further on it, as it seems to me from the illustration that accompanies the notice of it, to be more convenient in its use than the ordinary marking gauge. The improvement consists in the shape of the stem, which is slightly oval on one side only, the other side being round so as to fit the hole of the gauge head, which is octagonal. Thus by a slight turn of the stem it can be tightened in a most effective way, and loosened as readily by a turn in the opposite direction. The inconvenience of a screw projecting from the head is thus entirely dispensed with. Marking gauges on this system are supplied at 7d. each, and cutting gauges at 9d. I also find that Mr. Lunt now makes his Handy "Parallel" Vice in two sizes larger than that at which it was at first produced. The following are particulars respecting the three sizes in which this vice is now made, which many an amateur mechanic may like to know :—

	Length of Jaw.	Opening of Jaw.	Depth from Top of Saw to Top of Slide.	Weight, about.	Price.
No. 1.	... $2\frac{3}{4}$ in.	... $3\frac{1}{2}$ in.	... 2 in.	... $9\frac{1}{4}$ lbs.	... 10s. 0d.
,, 2.	... $3\frac{1}{4}$ in.	... 4 in.	... $2\frac{1}{4}$ in.	... 18 lbs.	... 15s. 6d.
,, 3.	... $3\frac{3}{4}$ in.	... $4\frac{3}{4}$ in.	... $2\frac{1}{2}$ in.	... 28 lbs.	... 21s. 0d.

This vice was described in page 139, Vol. III., of this Magazine.

8. *Velocipede Fret Saw.* — Not many months ago, a correspondent sent me from America the catalogue of an American manufacturing firm—the John Wilkinson Company, if I remember rightly—and when commenting on it I took occasion to point out that fret-sawing machines, known as Velocipede Fret-Saws, were in use in America, and to advocate their introduction into this country. Since that time, Mr. J. H. Skinner, *East Dereham*, *Norfolk*, by whom their utility and convenience were recognized as well as by myself, has done what I suggested, and machines of this description may now be procured from him. They are made in two sizes, known as No. 1 and No. 2. Of these, No. 1 is the larger and more powerful, as it will cut wood of any thickness up to $1\frac{1}{2}$ inches, and admits of a swing of $17\frac{1}{2}$ inches round the blade; but the table does not tilt, and it is by no means as light and elegant in appearance as No. 2, which is illustrated in Fig. 2. It weighs 40 lbs., and its price is £2 12s. 6d., or, without blowing attachment, £2 2s. 6d. No. 2 cuts pine up to 1 inch in thickness, and has a swing of $14\frac{1}{2}$ inches round the blade; it will saw and drill ivory, bone, metal, shells, etc. The table has a bevelled adjustment, by which it can be set for inlaying, mosaic, and other work. The clamps that carry the saw blade are of hardened steel, and work on slides which move in permanent side-ways above and below the table, giving the blade a positive and accurate motion. Perfect tension of the different lengths of blades used is also effectually accomplished by a simple but handy arrangement of the parts of the machine. Its price, complete, is £3 5s., or, without automatic dust-blower, £2 15s. The operator sits in front of the machine, on a high stool, and works the treadles attached to the large wheel with his feet, in the same manner that he would work a bicycle or tricycle.

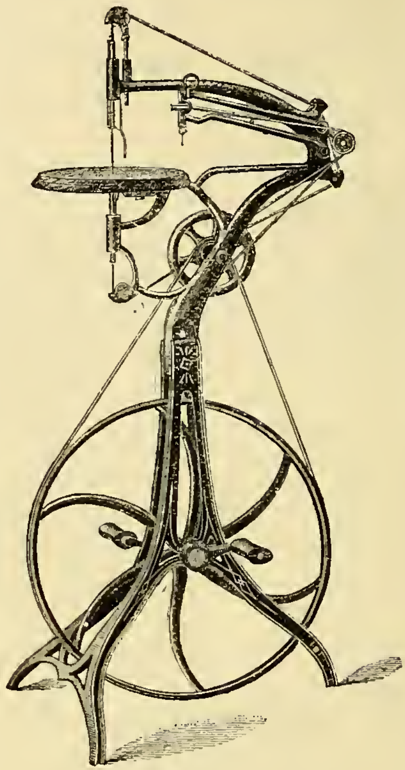


FIG. 2.—VELOCIPEDE FRET SAW.

9. *Skinner's Three-Ply Wood for Fret-Cutting.*—Fret-sawyers will be much pleased with the three-ply fretwood that is now manufactured by Mr. J. H. Skinner at his works at *East Dereham.* This wood is made in three thicknesses of veneer, the centre piece running the opposite way of the grain to that of the other two, the layers being glued together under great pressure, so that when it is cut it presents the appearance of solid board. The advantages of crossing the grain of the central layer are obvious, inasmuch as the wood cannot split, and warping is wholly prevented. In cutting fine and intricate work, it is greatly superior to ordinary wood, because, owing to the grain running in different directions, it is not so liable to fracture as solid wood, when cutting across the grain. The prices per square foot are as follows :—

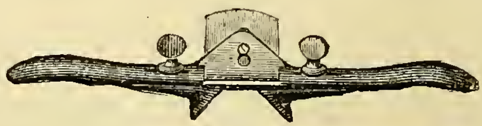


FIG. 3.—THE NEW AMERICAN CHAMFERING SHAVE.

	Walnut.	Mahogany.	Cedar.	Light Oak.	Brown Oak.	White Chestnut.	Sycamore.
$\frac{1}{8}$ inch thick	... 6d.	... 6d.	... 5d.	... 5d.	... 6d.	... 5d.	... 5d.
$\frac{3}{16}$,, ,,	... 7d.	... 7d.	... 6d.	... 6d.	... 7d.	... 6d.	... 6d.
$\frac{1}{4}$,, ,,	... 8d.	... 8d.	... 7d.	... 7d.	... 8d.	... 7d.	... 7d.

AMATEURS IN COUNCIL.

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine, the information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

Castings for Compound Microscope.

MR. THOMSON.—Owing to the request of a correspondent, the author of "How to Construct a Compound Microscope" has specially prepared a complete set of patterns for the above, and is now in a position to supply castings from a first-class foundry for its construction. The castings, which are remarkably clean and sound, are twenty-four in number, including those required for mounting the mirror lenses, etc. The price of the complete set is 15s. Rackwork, pinion wire, and length of steel wire for the adjustments, 1s. 6d. extra. The above sum does not include carriage, which would vary according to distance. If sent by parcel post it would be 1s. 9d. The Editor will send MR. THOMSON's address to any reader of AMATEUR WORK who wishes to purchase a set of castings, on receipt of an envelope stamped and addressed.

Automatic Incubator.

R. H H. (*Alford*).—I prefer to answer all queries in these pages, especially so when the answer may be of service to others besides the one asking the question. As regards the thermometer, any optician will make or procure one for you; however, if you have any difficulty in getting one (and there may be others in the same fix), the manager of the Electric Apparatus Company, 4, *Trafalgar Buildings, Charing Cross, S.W.*, will send one with the platinum wire fixed at any degree of temperature for 6s. 3d.; or with platinum wire adjustable to any degree of temperature for 9s. 3d., post free. They have also lately introduced a metal *fire alarm*, which would act in every way, as well as a thermometer. It works by the expansion of a metal plate, and can be regulated to make contact, at any degree of heat by a small screw. This they will send for 4s. 3d., post free; and as there doesn't seem to be much chance of this getting out of order, and it certainly is not so fragile as a thermometer, I should say it was very suitable for the purpose. If you will take my advice, don't attempt to make an incubator until you know how to work from a plan drawn to scale. It is very easy when you know how, and any mechanic in your neighbourhood could, I should think, explain it to you in a few minutes.—CATO.

Travelling per Kite.

CYMRON C. writes:—"If ONE OF THE RISING GENERATION will look in the *Boy's Own Paper*, Vol. III., pages 57, 68 and 93, he will find some articles entitled 'Kites Against Horses,' which I think will tell him what he wishes to know."

F. J. M. (*Sevenoaks*), writes—"I have taken AMATEUR WORK from its commencement, and among other things have managed to bind books very creditably from the articles that have appeared in its pages, and I have noticed the uniform kindness and courtesy with which you have always answered correspondents, or assisted Amateurs in Council. This being the case, I was surprised to read your reply to ONE OF THE RISING GENERATION, *re* Travelling by Kite, and think you should not have told him you found '*a place for his palpably ridiculous queries, for much the same reason that farmers nail hawks and magpies to a barn door when they have shot them.*'" [The italics are F. J. M.'s, not mine.—ED.] "After having given him such a severe talking to, you will perhaps in your next part kindly inform him that he no doubt saw the pictures he mentions in Vol. III., *Boy's Own Paper*, and from which I have made the following extracts. The first article is headed, 'Kites Against Horses, or Kite Carriages Extraordinary, and How to Make and Use Them.' In the year 1827 there was published an extraordinary book, here is its title page—'Nil Mortalibus Ardnum Est, The Aeropleustic Art; or, Navigation in the Air by the Use of Kites or Buoyant Sails: Things Unattempted Yet. By George Pocock.' 'After many trials and improvements in his kites, on January 8th, 1827, a carriage with six persons and luggage did the mile in two and three-quarter minutes, and mile after mile was completed at twenty miles per hour.' Even this speed, high as it was, was exceeded, and in the *Mechanics' Magazine* for August 13th, 1836, there appears an announcement that 'on Monday sennight Mr. Pocock of Bristol, passed through the town of Chippenham in a carriage drawn by two kites, occasionally travelling at the rate of twenty-five miles an hour. Running along the London Road the carriage came up with that of the Duke of Gloucester, who was travelling with two pairs of post-horses. The kite carriage passed him, drew up to let his Royal Highness go by, and then shot past at top speed as if he was standing still.' Kite carriages were by no means uncommon. The old Duke of Cambridge (father of the present Commander-in-Chief) had one with silken kites, and instead of driving in the park used to go out for an evening ride up and down the Edgware Road. Now for kites against sails. 'Forty years ago the kite sailed boat *Laura* was matched against the yacht *Gipsy* to sail from Rownham to Old Passage and back, when the *Gipsy* yacht was very easily beaten by the kite sailed *Laura*.' You will, I am sure, in fairness to ONE OF THE RISING GENERATION inform him that at pages 57, 68 and 93 of Vol. III. of the *Boy's Own Paper*, he will find full directions how to make both kites and carriages, if he wishes to make a trial of that description of locomotion." [My object in making the remark that you have italicised in your communication was to warn others against seeking information that is absolutely useless to readers of this Magazine. AMATEUR WORK is a practical magazine, and no room can be found in it for vain speculation on fads and subjects that are useless and generally impracticable. The successful experiments that you cite above, in which kites have been harnessed to carriages and utilised as traction engines, by no means form an argument in favour of trying to get about the country or over the surface of the water by such a means of locomotion. "One swallow," you know, "does not make summer." Wind and weather would have a great deal to do with the matter, and the prevailing wind, whatever it might be, would only suit those who wanted to go in the direction toward which it was blowing. And then all hose who wanted to go towards other points of the compass would be disappointed and probab y disgusted. There is no chance of tacking and sailing against the wind with a kite as you can in a sailing boat. Such a subject may well be ventilated in the *Boy's Own Paper*, as a curiosity of locomotion, but the demands on my space prevent any indulgence in speculative and unprofitable matter of this kind, even if I were inclined to encourage and permit it, *which I am not*. The correspondent on whose behalf you write seemed to me to ask if it were possible to travel through mid air *per kite*, tied like a tassel to the end of the tail, which struck me as being an unnecessary and absurd question to ask. Your letter is written in a kindly and pleasant spirit, and I am glad to give publicity to it. But I am still of opinion that it is far better to stick to bicycles and tricycles which afford practicable means of getting from place to place than to waste time and money over a mode of locomotion which could never be put in operation at any and every time that it might be desired to take a trip.—ED.]

BOY'S OWN writes that ONE OF THE RISING GENERATION will, in answer to his first question, find full particulars of above in Nos. 93, 94 and 95, *Boy's Own Paper*, Vol. III., published at the *Leisure Hour Office, Paternoster Row*. A carriage drawn by kites ran between Bristol and London, in August, 1836 (see *Mechanics' Magazine* for 13th August, 1836.) [A painful example of misapplied and useless ingenuity. Still, we are all obliged to BOY'S OWN for the information given, and I hope to hear further from him. —ED.]

The John Wilkinson Company.

S. M. L. (*Goderich, Canada*), writes:—"I have seen one or two recommendations from amateurs, as to their pleasure in dealing with the John Wilkinson Company, of *Wabash Avenue, Chicago, U.S.* I can also add my testimony in their favour, having had dealings with them for years, and have always found them prompt, obliging and reliable; they carry a large stock of excellent tools, etc. They also deal in archery, sporting goods, bicycles," etc., etc.

Cheap Still.

J. P. writes:—"I must caution readers against the use of a still as sketched by L. R. in page 45, the result would be a dangerous explosion and possible blindness to the operator. The tube should not be corked into the receiver, but should be left loose, and be long enough to reach to the bottom of that vessel. It is unwise for any but those who have had practical experience to answer such queries as this one." [This was no reply to a query, but a suggestion from a reader of the Magazine. —ED.]

Violin Making.

Novum Sarum writes:—"Allow me to inform Mr. Heron-Allen that asphaltum will *not* dissolve in alcohol—at least, that is my experience; also, that his two articles on 'Varnish for Fiddles' contain much excellent matter, but conveyed in such obscure and confused language as to be practically useless to beginners. Amongst other things, why give all receipts in French measures, and no guide to their equivalents? Either they should have been in plain English ounces, etc., or else the reader should have been told that 1 litre=1 claret bottle, 100 cc.=1 wine glass, 1 gramme=15 (plus) grains Apothecaries' weight, and so on. Anyone able to wade through the confusion of style would no doubt succeed in producing a capital varnish from the directions given, but I claim to have discovered a far better varnish, or rather series of three or four heterogeneous varnishes (as per Mr. Charles Reade), without a tenth part of the trouble involved in Mr. H.-A.'s process." [Will you not tell us what your discovery in varnish is, and then Mr. H.-A. and other experts in Violin Making will be able to judge of the value of it? Again, on reconsidering your table of measures, 1 litre =1 claret bottle, 100 cc.=1 wine glass, do you not think that your equivalents in bottle and glass are also somewhat "obscure and confused." Are all claret bottles rigidly alike in capacity, and do wine glasses, one and all, hold precisely the same quantity—no more or less? Good Mr. Whitaker in his invaluable Almanack tells us that 1 litre, or cubic decimetre = 61·02705 cubic inches, but I am afraid that this is not exactly the cubic content of wine bottles—one and all: and from the same authority I gather that 1 gramme = 15·43235 grains, which is certainly a more tangible quantity than "15 (plus) grains Apothecaries' weight" unless plus = ·43235 grains, an equation of which I have been hitherto ignorant. Still it is as true that "It is never to late to learn" as "It is never too late to mend," *teste* your own authority, Mr. Charles Reade, so Mr. Allen and I may take comfort from this, and hope to know better by-and-by.—Ed.]

Two Enthusiasts.—One of them writes "for self and partner":—"A friend and myself have succeeded, during the last fifteen months, in making about twenty-three violins from the instructions given in your Magazine, some of which have received very flattering encomiums. The only difficulty we have had is with the varnish, which persists in coming out yellow instead of a deep red—whether we put in dragon's blood first or last. We had about ten trials at it, but the result was comparative failure as regards colour? Would anyone who has succeeded sell me a small sample of his? We are now anxious to turn our attention to the larger instruments—*violoncellos and basses*. Could you venture to set aside a little space for this subject? It would not take up much room. Something supplementary to the violin instructions already given would do—the details of thicknesses and measurements, shape of *ff* holes, would be all that is necessary, although a good pattern of the body would not be altogether out of place. How are such broad large bouts bent without cockling? Is a special iron necessary? Perhaps Mr. Allen might answer the foregoing shortly but effectively, and oblige."

Hydraulic Motor.

S. B., Jun. (*Bolton*).—The motor as described in page 502 is quite capable of being worked to over half-horse power. The fall of water, size of pipe, and amount of primary pressure, *i.e.*, pressure of water at the inlet or take of the supply (which would be in some cases the cistern), must be known before any calculation can be made of its power. If made to scale, the wheel would be 3 inches wide by 20 inches in diameter, with a bearing power of the width of wheel, and ample depth of buckets to take more water than could be forced through ½ inch pipe, without waste of water, or leakage between wheel and case, which must in all cases be avoided. If you have any doubt about the power being sufficient for your purpose, increase the size of your supply pipe to inlet, L, and put the tap on the supply pipe, using a short piece of ¾ inch or ½ inch pipe to fit into the hole bored in case; you can then connect the two with a piece of indiarubber tubing, and should the power be insufficient upon trial, enlarge the inlet, L (and, of course, the outlet in proportion), until it is the full size of the supply pipe, which can be advantageously increased to a full inch in diameter, where the pressure of water is low.—Cato.

[I am glad to say that Cato has returned from Africa, and can now reply to any queries that may be addressed to him with reference to the Hydraulic Motor. Commenting on Boxwood's query to which Olla Podrida most kindly and fully replied in Cato's absence, he points out an erratum, or rather an *omission*, in Vol. II., page 502, col. 2, line 16, and says that instead of "three pieces of pine plank," we should read "three pieces of *three inch* pine plank," and then shows that the diagram to which Boxwood refers scales 3 inches without case, and not 4 inches, and asks how he can imagine it possible to cut a wheel 4 inches thick out of 4 inch plank? Cato's absence from England rendered it impossible for him to correct the proof of his article, and thus, without doubt, arose the omission, whose insertion would have rendered things clearer to Boxwood.—Ed.]

Fishing Tackle for Fresh and Salt Water.

Bing.—Your question is a perfectly reasonable one, and the probable reasons for sea tackle not being finer than it is will occur to you on reflection—namely, because the natural surroundings of that kind of fishing are rougher and require more strength of the various materials employed. It is one thing to fish from a pier or off shore on a calm quiet day, and another to do so with a "lumpy" sea. Nevertheless, there can be no doubt but that nine-tenths of the sea-tackle made is too coarse, and that finer and even stronger tackle may be made to the increase of sport. I once had a splendid catch of mackerel by using ordinary trout-spinning tackle, and the man who despises a mackerel fresh from the water on his table is not much of a gourmet. No fresh-water fish equals it. Perhaps, at some future time, with the Editor's permission, I may give a series of papers on Sea-Fishing and its Tackle, and I shall then show how the tackle adopted for fresh-water fishing can be used with advantage by the sea angler.—J. H. K.

Making Hydrogen Peroxide.

F. C. A.—This is a job outside the province of amateur chemistry, since it involves the use of expensive apparatus and a special knowledge only acquired by practice. The method of preparing this *oxygenated water* is as follows: Dissolve peroxide of barium in dilute hydrochloric acid contained in a vessel kept cool with ice, then precipitate the barium from the solution, as barium sulphate, by cautiously adding sulphuric acid. The supernatant solution must be carefully decanted and used on fresh quantities of peroxide of barium until the acid ceases to dissolve any more barium afte several trials. Even then it will be foun to contain some hydrochloric acid, and this must be got rid of by carefully treating the solution in succession with sulphate of silver and baryta-water. The whole process demands the greatest care and attention on the part of the operator. The finished solution is one of HO_2, not H_2O_2, as mentioned in your note.—G. E.

Photo Studio.

W. W. E. (*Rotherham*).—The size mentioned (24 feet by 9 feet 6 inches) will do very well, and the eaves may be 6 feet and the ridge 10 feet from the ground. The north light should come down, say within 18 inches or 2 feet of the floor. The advantage gained by skylight on both sides is very questionable; it would be better to have it all on the north side with blinds, and to change the places of the camera and sitter respectively according to the side to be taken. W. W. E. will find useful directions for a cheap and efficient studio in the *Photographic News Almanack* for 1879.—[J. P.]

Designs for Inlaid Table, etc.

W. J. B. (*Clapton*).—I regret very much that I cannot give the designs you ask for. A bold design for a table about 4 feet square, inlaid with about one hundred and fifty different kinds of wood, is more than can be managed in the space at command. Apply to Mr. Thomas J. Syer, 1, *Finsbury Street, Chiswell Street, E.C.*, and he will tell you where to get the various kinds of veneers.

Rubber Stamp Making.

G. McG. (*Manchester*).—Papers embodying full instructions in India Rubber Stamp Making will be found at pages 331 and 421 of Vol. II. of Amateur Work. For materials and any information on the subject write to Messrs. Samuel Oakley & Co., 148, *Blackfriars Road, London, E.C.*, who, as stated in Vol. III., page 490, are the successors and representatives of the late firm by a member of which the papers were written to which reference is made above.

Munks and Sons' Plane.

Twist Drill.—The plane that you commend as "a very handy adjustable plane," whose maker you do not know, happens to be the very smoothing-plane sent out by Messrs. Munks and Sons. It was patented in January, 1884, as you may see from the illustration in page 285, Vol. III. You have described and sketched the plane very accurately. I am glad to find that yours is as useful to you as mine is to me.

Tuition in Riding Bicycle or Tricycle.

Mr. H. Goy, Athletic Outfitter, etc., 21 & 22, *Leadenhall Street, E.C.*, writes:—"I have noticed, in answers to queries from some of your correspondents on tuition in riding bicycle or tricycle, the reply you give is 'Teach yourself.' This process, as applied to bicyclists, will not tend to increase the ranks of riders, as there is nothing which tends to decrease nerve power so much as unnecessary falls. Will you allow me to state that I have two schools for teaching the art, in both of which will be found experienced and careful assistants. The schools are situated at my West End Branches, viz.: The Belgravian Gymnasium, 30, *Sloane Street, S.W.*, and No. 2, *Praed Street, Edgware Road*; perfect teaching guaranteed for half a guinea. Special attention is given to ladies learning to ride the tricycle, both as to privacy and comfort. If you will kindly make this known I am sure it will increase the number of riders, as there are thousands of would-be bicyclists or tricyclists who now look with envy on the delightful exercise." [I am very glad to give publicity to Mr. Goy's letter, though I cannot plead guilty to having given the advice which he attributes to me. My own impression is that it is very much better to spend the very moderate sum of 10s. 6d. in learning to ride than to run the risk of injury and intimidation from the numerous falls that a self-teacher must experience. I may add to this that a Silver Medal has been awarded to Mr. Goy by the Jurors of the International Health Exhibition for general excellence in Athletic Apparatus under Class 39.—Ed.]

Repoussé Work.

Excelsior.—As soon as I can meet with a really competent writer on this subject who can describe the process with clearness and exactness, and furnish some good designs, some papers on it shall appear. I have had offers made and designs submitted, but the latter were far from being up to the mark. There was no classified Index to "Amateurs in Council," in Vol. I. I should like to see Indexes to Vols. I. and II. prepared on the plan I have adopted for Vol. III., but I fear there is not much chance of its being done. Meanwhile you and others that wish for an Index to "Amateurs in Council" in Vol. I. might compile one in manuscript for your own use.

Kindly Help for Amateurs.

D. B. A. (*Finsbury*) writes:—"I have only lately examined Amateur Work, which pleases me so much that I have got all the back parts. As you will see from my address, etc., I am in a trade in which many of your readers seem to take considerable interest. If any of them are in difficulty which might be removed by seeing a piece of furniture such as they want to make, they are quite welcome to examine anything I have in stock, if making for their own use, *not for sale*. I shall be happy to send you designs occasionally of furniture with working drawings, if you like." [I shall be most happy to receive designs from you when you like to send any, and I will give your address to any amateur in difficulty who will send an envelope stamped and addressed when making application for it.—Ed.]

Rough on Amateur Work.

H. R. J. (*Hackney*) writes:—"The accompanying cutting is rather rough on amateur work. It is evident that the domestic economist referred to was not a subscriber to your journal."

The cutting sent by H. R. J. ran thus—

"True Economy.—Binks was having a number of pictures framed. He figured close on the matter, and came to the conclusion that if he bought his own glass he could get the frames made at so much a foot and save about ten per cent. by putting the glass in and fitting the backs himself. He carefully measured the frames and got the glass cut at a down town place. He broke the largest sheet when he was taking it home. He set the rest up in his amateur workshop, and that night, when hunting in the dark for a screw-driver, he put his foot through another sheet. Getting to work, he framed one picture, and on looking at the finished job saw that he must wash the glass, and in taking it out the frame he knocked the hammer through picture and glass, consequently he didn't need to wash that particular pane. The next sheet was a trifle large for the frame, and in chiselling away the rebate he drove the chisel clear through and ruined a handsome frame. As the rest of the sheets were cut too small, he fears the ten per cent. is about absorbed. Economy is wealth."

Poor Binks put his foot in it literally and metaphorically. Amateurs like him will find it cheaper to go to Gus Rochefort, 20, *Basinghall Street, E.C.* A visit will save them a mint of money and mortification too.

Hexagonal Wire for Nuts.

A. F. S. (*Dresden*).—As regards wire of hexagonal or octagonal shape for nuts, write to Mr. Bateman, *Fleet Street, London, E.C.* I am not quite sure it can be had, but it is possible. Nuts need patience, but a friend of mine once made a model ship with six hundred hand-made blocks, all with brass sheaves. Each block was made separately. The trade supply nuts and bolts of the size needed very cheaply.

Book on Lathe Building.

A. F. S. (*Dresden*) will find details of the cheapest lathe construction in "Turning for Amateurs," noticed in page 180, Vol., III., of this magazine, of which a new edition is just published; but his complaint of cost, and the time it would occupy to make one as described in Amateur Work, entirely clashes with his intention to make one of a much more elaborate kind. How quickly and easily does he expect to make a 5½ inch triple-geared lathe? He will find his work cut out for him, and work far more difficult than would suffice for the construction of two such lathes as Mr. Lukin has described.

Ice House for Storing Fish.

W. L. (*Cullercoats*).—You seem to have followed your own devices entirely, and in no way to have attended to the directions given in Vol. III., page 292, for building a Refrigerator or Ice Safe, or those in page 495 of the same volume for an Ice House. You have made an air-tight box lined with zinc, and put it in a house above ground whereas my instructions were for an under ground chamber. Your box is like a Norwegian cooking stove, in which a vessel containing food to be cooked is put in at a certain temperature, and remains at that temperature or a little under, thus cooking the food and keeping it hot. You put ice and fish into this air-tight box, and the result was that the temperature remained virtually the same, while the fish went bad, and the ice, I suppose, melted. I cannot help you further than by recommending you to try the refrigerator, mentioned above, on a large scale.

Charging Accumulators.

Ignoramus.—No special form of commutator will be required on the dynamo machine to fit it for charging accumulators. The machine will give a continuous current in one direction alone, but the force of this current will vary with the speed of the machine. When this falls below that necessary to keep the E.M.F. of its current above that of the partly charged or fully charged accumulators, these will discharge through the machine and reverse the polarity of its magnets, together with the direction of the current. It will therefore be necessary to keep up the speed of the machine whilst charging the cells, and to switch these off at once when the speed falls, and before the machine is stopped. The E.M.F. of fully charged accumulators arranged singly in parallel is about two volts. The machine will give a current with an E.M.F. of five volts at a speed of from 800 to 1000 revolutions per minute, so you will see that a fair margin is left over for charging purposes, providing you do not arrange the cells in series.—G. E.

Voicing Harmonium Reeds.

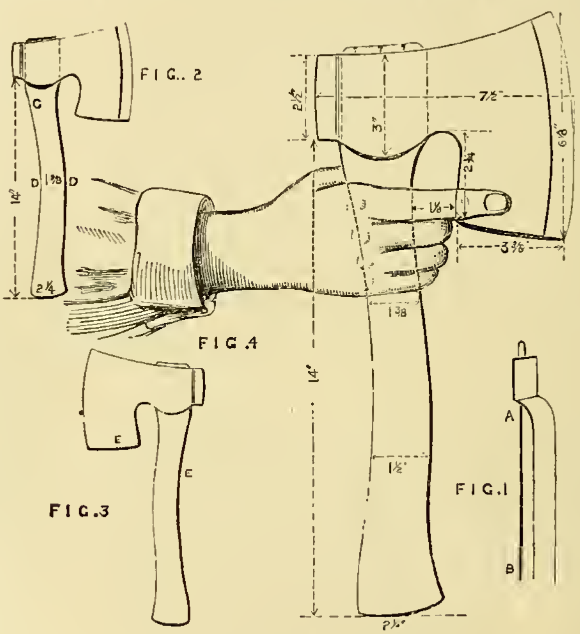
H. K. K. (*Bayswater*).—I am not a reed voicer, that being a special branch of the trade, but I may say as the opinion of one who is an able voicer, that it is not possible for anyone to voice reeds by written instructions, as it requires a trained ear and considerable practice. Again, it is very unusual to voice harmonium reeds (as American organ reeds are voiced), as they are much thicker. The only advice I can give you is to buy a good set of reeds, and have a *good* tuner to look after them.—A. J. (*Clapham.*)

Clock Cleaning.

T. B. T. (*Carnew*) writes:—"It might perhaps be well for the readers of Amateur Work to know that a clock can be cleaned very well indeed with a mixture of rottenstone and paraffin oil."

A Useful Tool for Amateurs—Coachmaker's Side-Axe.

A Practical Carriage Builder writes: —"Feeling a keen pleasure in all the various subjects discussed in our universal journal, Amateur Work, I make a special point of studying the numerous articles in 'Amateurs in Council,' and cordially agreeing with the spirit of the letter you publish from J. R. (*Ballater*), in page 541, Vol. III., I must say I feel disappointed at the meagre way in which the coachmaker's axe has been treated; and if a good tool is to be valuable to amateurs and others, let us all in the name of good fellowship assist as much as possible, in easing any seeming difficulties which may from time to time appear. Now the side-axe (so called being bevelled, and mostly used on one side only) is undoubtedly a most useful, nay, valuable tool; but it is also most treacherously dangerous in the hands of the unskilled; and knowing this, to my cost, I venture a few remarks on the way in which the handle should be put in the axe-head (as the purchaser has to do his generally himself); and also, how to hold the tool in the act of chopping. I send you a full-size sketch of mine, which has been in use about twenty years, and having had a careful usage, is not a great deal smaller than when I bought it. When about to put in the handle of a side-axe, choose a piece of young, hard, straight, close-grained English ash, 2 inches thick, and 3½ inches wide, 17 inches long, face up one side. Now proceed to fit it into the head of the axe, keeping the planed-up side towards the face side (*i.e.*, cutting side); having fitted this part carefully and tight enongh to require a good smart blow or two to drive home, now hollow the planed-np side out from A to B, as shown in Fig. 1, about ⅜ inch. This allows the thumb to clear yonr work when chopping a wide piece of timber; if not done so, it is obvious the thumb would suffer severely by contact in the act of reduction. Now turn attention another way, looking at the off side, the axe and handle will be something near the shape shown at D D, Fig. 2, being the rough haudle, mark out the shape, to be similar to inner lines, C C, in Fig. 2. Knock off the head, saw out to these lines, work edges up square with a spoke-shave, set a carpenter's gauge to 1⅜ inch, aud gauge from the hollowed or face side, and clean off down to this line. Now round off edges to a nice easy oval, starting from directly below the head with spoke-shave. Now drive handle into head, and grasp the handle at E, Fig. 3, placing the fore finger (right hand of course) on the point F. Herein lies the chief art and effect of using this axe: the palm, thumb, and three fingers grip the handle, and the first finger steadies the virtually directs the cut. If when thus tested, the tool suits the hand, clean up with file and glass-paper, make two or three saw cuts in the top of handle, and drive in some stiff oak wedges, and clean off. Either level, or leave the top end of handle to project ¼ of an inch, and pare off edges mitre fashion. Should the grip not be perfect, take more off the back of handle at E, Fig. 3, and continue to reduce tho thickness at that part until suitable to the hand. Fig. 4 shows this axe finished for use, and method of holding. It will at once be seen the immense advantage this tool has over the common chopper. Before using give the handle a good soaking with linseed oil. When using the tool, be snre to hold tho face of axe sqnare with the work, and straight in front of you, holding the work, with left hand placed as high up as possible, and convenient, and gripping it firmly, commence chopping away to the lines on your work from the bottom end, which should be rested on a block of some hard wood, such as elm or oak, about 16 inches high, the grain of block perpendicular to the floor. Work thus npwards, humonring the grain of the work in hand as much as possible, to prevent the axe from cutting through the lines and spoiling the job. When purchasing the axe-head, choose one whose weight is 4½ lbs.; not more, in fact, rather less if anything. Examine the face or steel side where the cutting edge is, very closely, and select one perfectly free from cross flaws, or anything having the least appearance of a surface crack, for if there is the slightest crack on this surface, every time the edge is worn down to this point, a great ugly gap in the cutting edge will follow, which is most annoying to the uscr, as it will necessitate regrinding and sharpening on the oil-stone, a most vexatious interruption, perhaps in tbe very middle of a particular job. Again, do not choose one with a perfectly flat face, but one that is rounding in every direction, say a good ⅛ inch high in the middle of face when a straight edge is laid on that point nearest the centre. This gives more complete control of the cut than a flat face otherwise would. A buyer will find these heads ground to a blunt edge, bnt most tradesmen who sell them will give a finishing touch when tbe head is bought if the buyer wishes it; and when handled up sharp the edge on oil-stone same as a chisel; aud as a well-ground and sharpened axe should not require re-sharpening more than once a month, providing contact with nails and all other foreign substances have been avoided, tbe best plan is to make a sheath for the edge, thus in a piece of hard wood, ash or elm (not oak, as there is a powerful acid always present in oak that will eat off the keen edge), about 2 inches longer than full length of cutting edge, 1¼ inch thick, and 3 incbes wide. Cut a groove 1⅜ inch deep in the thickness of this piece, the groove to be wide enough to admit the blade, and tight enough to require forcing on with hand pressure, but without knocking. Pnt this sheath over the edge of axe, nail a stont strap on one side of it, about its middle. Bring the strap round tightly to other side, where pnt a ⅜ inch round-headed screw on the wood. Punch a hole in the strap, and put the hole over head of screw, and your axe is out of all danger of being gapped by anything hard being forced against it. This is how I keep mine always sharp with little labour, and also why mine has lost so little weight by grinding," etc.



COACHMAKER'S SIDE AXE.

Fig. 1.—Groove in Handle for Thumb. Fig. 2.—Mode of Shaping Handle. Fig. 3.—Axe when fitted with Handle. Fig. 4.—Axe, showing how it is held, and dimensions in all parts.

Model Electro-Motor.

P. A. C. (*Brighton*).—Wind the horse-shoe cores with four layers of No. 20 silk-covered copper wire. The armatures with four layers of No. 28 silk-covered copper wire. As you will have four sets of wires proceeding from the armatures, you should use a disc commutator in four segments, instead of two, as illustrated in the article on "How to Make a Small Dynamo-Machine," in page 317, Vol. III.—G. E.

"Graph" Composition.

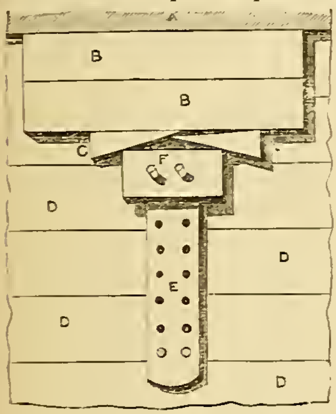
F. A. (*Gainsborough*) points out that in the recipe for "Graph" Composition given in Vol. III., page 443, we must read "carbolic" for "carbonic." He is thanked for the recipes he sends for the benefit of Shaving Paste, but I do not insert them, as sufficient have been already given, and these do not seem to differ in any way from the ordinary formulæ.

Dovetail Jointing.

J. J. C. (*Dundalk*).—The method of making dovetail joints of all kinds is described in Part IV. of "Every Man His Own Mechanic," which the publishers of this Magazine will send you on receipt of 7d. in stamps.

Contrivance for Clamp.

D. S. writes :—"The following contrivance for a clamp, which I always use in my workshop, may be useful to others. It is made as follows: Procure a piece of wood not less than ¾ inch thick, 3 inches wide, and from 2 to 3 feet long, according to length of clamp required. Another piece of wood, ½ inch thick, and long enough to project an inch on either side of the first strip, has two holes bored in it, to correspond with similar holes, which must be bored in the long strip, at a distance of about 1 inch from each other. Through the holes in the cross-piece are passed two



CONTRIVANCE FOR CLAMP.
A, Wall; B, B, Boards in Clamp; C, C, Wedges; D, D, D, D, Floor; E, Long Strip; F, Cross Strip secured by pegs to Long Strip.

stout pegs, which must exactly correspond with the holes in the long piece. Also get two wedges, 3 to 4 inches long, and tapering down from 1 inch. To work it, the clamp is fixed with one end fastened to the floor or some other convenient place, and the other end touching the wall. The cross-piece is then moved up to the holes nearest the edge of the boards to be joined, and fixed there with the pegs. The glued boards are then placed against the wall, and the wedges driven tightly in between the cross-piece and the outer edge. I can recommend this clamp as being extremely serviceable and extremely cheap."

Skeleton Leaves.

J. W. R. (*High Harrogate*).—The simplest way is to soak the leaves in rain water until they are decomposed. The leaves should be placed in a tub or pan, completely immersed in the water, and allowed to stand in the sun for about two or three weeks. The leaves may then be floated on to cardboard and the fleshy part or epidermis, as I may term it, removed with a camel hair pencil. A quicker method is to make a solution of caustic soda by dissolving 3 ounces of washing soda in 1 quart of boiling water and then adding 1½ ounce of quicklime previously slaked. Then boil for ten minutes, decant the clear solution, and again bring it to the boil. While boiling, put in the leaves and boil them briskly for an hour, adding hot water from time to time to supply that which is lost by evaporation during the process of boiling. Take out a leaf, put it into a vessel of water and rub it between the fingers, holding it under the water. If the skin and pulpy matter come away easily the rest of the leaves may be removed and treated in the same manner, but if not the boiling must be continued for some time longer. There is a preparation for skeletonizing leaves known as "Foliatype," which is sold at 1s. per packet, and which may be procured from Messrs. Houghton & Co., 32, *Poultry, London, E.C.* I cannot vouch for the efficacy of the preparation, but the beauty of the specimens exhibited as having been produced by its agency is such as to make me think it is well worth a trial.

Etching on Glass.

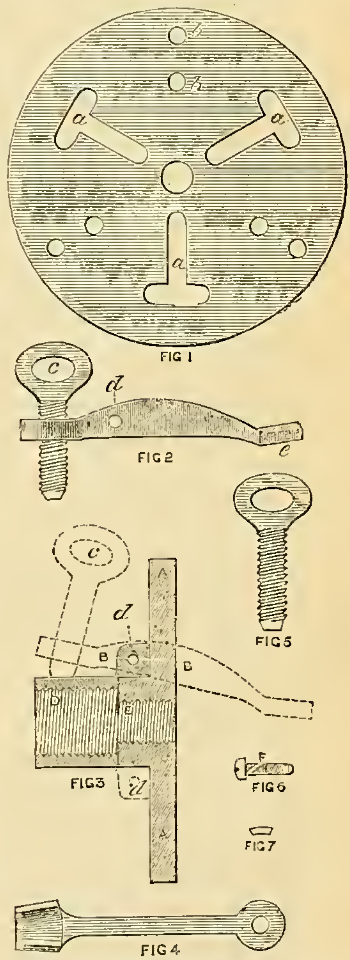
Vectis asks for detailed instructions for engraving glass by the acid process, including information as to the preparation of the stencil plates required for first printing the designs on the glass. Mr. A. F. Soward will write on this subject in continuation of his article on "Etching on Glass" in Vol. III., and the paper shall appear at the earliest possible opportunity, although this may be far from early in your and other readers' acceptation of the term.

How to Make a Berceaunette Perambulator.—Errata.

A Practical Carriage Builder points out that in his paper on this subject in Vol. III., page 535, col. 1, line 20, we should read "5½ inches each side of the centre line A B" instead of "5¾ inches," etc., and that in Fig. 3, in page 536, the full length out to out at extreme top of body is "33 inches," whereas it should have been "35 inches."

Face-Plate with Dogs for Amateurs.

Rough (*Scilly*) writes :—"I am so much obliged for the hints that I have received from you in 'Every Man His Own Mechanic' and Amateur Work, that I have sent you on a hint that, I think, may come handy to someone. You have given a good description of lathe chucks, first and last, but they amount to so many, that one wants a chest to keep them in, and as I move about a good deal, I thought I must reduce the bulk and expense, so I had the articles (as per sketch) made. I do not know the trade terms, but I call Fig. 1 a face-plate, and as no one can do without a thing of this kind in turning, I utilized mine for more purposes, viz., dispensing with all chucks. I made three dogs, which can be taken out when they are not wanted. The face-plate in section, Fig 3, shows the dogs in place by dotted lines, and the flanges by which they are held by, and of small screw in Fig. 6. Fig. 2 gives dogs, with dog-screw out and set-screw in. Fig. 4 gives under side of dog, with dog-screw and set-screw out. Fig. 5 shows set-screw, and Fig. 6 dog-screw. Now by slipping the dogs through the slots made for them in face-plate at *a*, *a*, *a*, they will nip anything from the size of a pipe-stem up to 3 inches, or, at least, mine will. For knobs of all sizes for buttons, or anything else that wants holding while it is being finished off, I find it very handy. I hope you will understand my rough sketches, which show the outlines of each part, as I laid it on the paper. If anything more can be done to help on our valuable Monthly, I shall be pleased to help. I have several contrivances of my own invention that I shall be pleased to forward to



FACE PLATE WITH DOGS FOR AMATEURS.
Fig. 1.—Front View of Face Plate; *a*, Slots in Plate for Dogs; *b*, Holes for Screws for securing Cap-heads, etc. Fig. 2.—Dog Elevation; *c*, Set Screw; d, Hole for Dog Screw; *e*, Nip of Dog End, curved as in Fig. 7. Fig. 3.—Face Plate in Section; A, Plate; B, Position of Dog; c, Set Screw; d, Holes in flanges for Screw to secure Dog; D, Female Screw for Mandrel end; E, Ditto for Dead Centre. Fig. 4.—Plan of Dog from below. Fig. 5.—Set Screw apart from Dog. Fig. 6.—Dog Screw, passing through d in Figs. 2 and 3. Fig. 7.—Section showing curvature of Dog end at *e*, Fig. 2, to obtain nip.

you at any time." [Send them by all means. Your sketches are perfectly intelligible; but as it is impossible to spare space for full-sized drawings, they have been reduced to one-third size.—Ed.]

F 2

Clock-Making and Repairing.

T. B. T. (*Carnew*).—In reply to your comments, let me say that you and your friends do not know the difficulty of getting *suitable and competent* persons to write on subjects that amatenrs do not, perhaps, take up as readily as others. The gentleman you mention in your letter was asked by me to write on "Clock-Making and Repairing," but he declined on the plea of having no time. However, you will be glad to know that I have in my pcssession the first of a usefnl series of papers ou the subject by an amateur who has gone into the subject expressly for the purpose of writing them, and that although no mention is made of them in the Prospectus of Vol. IV., I shall commence their publication as soon as some of the subjects already commenced are worked off. Mention this to your recalcitrant friends, and remind them that "half a loaf is better than no bread," aud that they will find AMATEUR WORK to be this to them, even without the special papers which they so earnestly desire. Arrangements are also pendiug for papers on Harmoninm Building and Repairiug, but thcy are not complete. Your young carpenter, with your kind assistance, will soon understand all he can read in the Magazine. I am with yon in all you say about the gentleman to whom yon refer in the seventh page of your letter, but who must not be named here.

Brassfounding for Amateurs.

CRUCIBLE.—A series of articles entitled "Brass Casting at Home," by F. J. Durrance, appeared in Vol. II. of this Magaziue. These papers will give you all the information you require oa this subject. If, however, there is any part you do not understand, Mr. Durrance will help you.

Paint, Boilers, Engines, Casings, Brazing *v.* Soldering, Riveting, Tubes, etc.

A. F. S. (*Dresden*).—Pray do not associate the name of trouble with our efforts to conceive your mnltifarious special requirements. On the contrary, it is a source of unmitigated pleasure to think that, however futile our efforts may be, we are trying to do good. The modest candour and simple brevity of your demands fills one's soul with a calm peace, quite refreshing at this season. You only *name* four colours that yon may "require," and refer to another with which fickle memory has apparently played truant with. Perhaps it is "Strondley's Green." No matter. So far good. Bnt now, listen! You want me and "others" to "understand," and be in readiness—at a momeut's notice, I presnme—to deliver and supply "*any other shade of green, or perhaps yellow*" that "you may *also* require." *Ach Himmel!* What shall we do? I am no colour merchant as others are. I only speak from experience of a limited few. I endeavonred to extend that knowledge for your especial benefit. I forwarded a query, bearing on your subject, to one of our leading technical journals. It appeared regularly for weeks in succession, but drew forth "nary" answer. I assure yon almost with tears in my eyes, that I "done" my "level best." Perhaps some one may yet do better. *Quien sabe?* As every paint, so far recommended, seems to possess qualities objectionable to you, and feeling pretty well convinced by this time that anything else proposed would meet the same fate, I therefore humbly advise yon to adhere to your own concoction, which you say you "intend using." With regard to the gratuitous information about your "perfect model," if you make your own drawings, try to "modify things" before sendiag to the founder. You will save trouble, and my experience is that it would be much cheaper. Again, I am consumed with curiosity to know what sort of a "model" your engine is, since it requires a "travelling crane" to put on the boiler casing. With reference to your omuiscient insinuations and implied doubt of my acquaintance with casings, allow me to inform you that I *do* kuow a little about casing boilers. I have cased and superintended the casiug of boilers more awkward in form than the comparatively simple one quoted by you. The *trouble* depends entirely upon the design of the casing. You are, I am sorry to say, inclined to be a little—just a little—hasty in your assumptions. It is best to braze fireboxes and all parts exposed to intense heat. The remainder should be riveted and soldered. That is what I have done. When the heat is moderate, or the water spaces large, riveting and soldering is best. Brazing, when properly done, does not tend to weakness. Of course it is easy, through neglect or iguorance, to buru or overheat a joint in braziug it. Screwed fastenings in small model boilers, and in the way I take it you mean, are absurd. If you were to anneal the ends of your tubes before expanding, then the incliuation to split wonld be checked. But *quant. suff.* Perhaps I'm all wrong again, and too much valuable space has been frittered away already. I trust, however, that *some* of the foregoing remarks may apply to your *especial* case.—OLLA PODRIDA, *née* AMIGO.

Useful Varnish.

K. G. writes iu reference to SAVOIR FAIRE's commnnication on this subject in page 541, Vol. III.:—"Dissolve the gum *in the cold*. It will be safer, and not take much longer; and nse methylated spirit instead of the rectified, unless you are overburdened with cash. A small piece of camphor dissolved iu the spirit is said to add to its solvent power. This I have not myself tried, and therefore I do not guarantee its correctness."

Preserving Skins.

RABBIT SKIN.—Either of the preservative receipts given in page 467 will serve to preserve the skin more completely than burnt alum alone. Skins dried with alum may be softened by treating them with yolk of egg, and drawing them backwards and forwards over the edge of a bluut knife—the operatiou known to glove-makers as "staking." Kid skins are cured with alum, and the beautiful softuess of kid gloves is gained by egging and staking. Glove-makers dry the skin after egging, and then lay it for an hour on damp sawdust, which so far relaxes it that there is no danger of cracking in the operation of staking.—G. W.

Craig's Transfer Gold Leaf.

ROSELEA writes:—"It may be you will not agree with me, bnt from experieuce I say that the most valuable parts of 'our' Magazine are your 'Notes on Novelties' aud 'Amateurs iu Council.' Could not you give us more of them? But my special object in writiug is to thank yon for your recommendation of 'Craig's Transfer Gold Leaf' in page 382. Wick did seem an out-of-the-world place to send to for gold leaf, or aught else, except herrings. However, I sent—I, a disappointed would-be amateur gilder—and now I am rejoicing in the fact that I can eqnal my professional brother. The last thing I tried was the uame of my cottage ou the gate pillars. I merely covered the letters (done years ago by the regular sign-painter) with gold size, and with four leaves I gilded them everywhit as well as if I had brought a painter from town to do the job. The letters are two inches long, and you, Mr. Editor, with the name before you, will see there could be absolutely no waste. I have got but one book from Mr. Craig. With no waste, it goes a loug way." [The testimony of those who have tried articles introduced to notice in "Notes on Novelties" is, I think, more valuable than anything I may say about them, and therefore I very gladly find room for snch communications as yours. The space devoted to "Notes on Novelties" must, to a very great extent, depend on the articles sent me for notice. As to "Amateurs in Council," I do my best to keep no correspondent waiting longer than possible; but I can assnre you it is a most difficult departmeut of the Magazine to deal with. It is not possible to enlarge the Magazine at the price charged; and all that can be done at present is to fetch up lee way by an additional eight pages when absolutely necessary.—ED.]

Induction Coil for Transmitter.

P. A. C. (*Brighton*).—Try this: Coil ends, $1\frac{1}{4}$ inches square; length between ends, $1\frac{7}{8}$ inches; core of soft iron wires, $\frac{3}{8}$ inch in diameter; thin, well-paraffiued paper tube over this; then three layers of No. 23 silk-covered copper wire as primary, and over this a sufficient qnautity of No. 38 silk-covered copper wire to fill up the reel, to act as the secondary wire. Insulate and level coils of wire with strips of thin paper well paraffined.—G. E.

"The Blowpipe in Chemistry."

F. A. E.—The price of "The Blowpipe in Chemistry" mentioned in "Notes on Novelties," page 538, Vol. III., is 3s. 6d. The Publishers had not made me acquainted with the price of the book, and so this necessary piece of informatiou was omitted.

Substitute for Clip in Mounting for Microscope.

EBB AGE writes:—"To those beginners in mounting microscope objects, who, like myself, may not be able to obtain the American spring clips, as recommended in 'Carpenter's Manual,' and require a simple and effective substitute, I would suggest the use of a slender cork, placed erect on the cover glass, and kept in position by a small indiarubber ring passed over its top and under the slide."

Pianoforte Tuning.

W. J. R. E. (*Rushden*), writes:—"I have in common with a great many of your readers, read the very clever papers on the above subject by Mr. W. Wellington Conolly, with the greatest interest, and in my case with the result of having gained as an amateur tuner most valuable information. I have always met with the difficulty when tempering fifths and fourths, of not knowing to what extent the tempering should be done. As Mr. Conolly says, Mr. Wicks is the first writer on tuning, who gives the number of beats which should be heard in a second of time, I have not made a monochord as it would be impracticable to take it to every piano tuned, for obvious reasons. Well, to be concise, for I do not wish to occupy your valuable space more than necessary, I find that though we have been told the number of beats that should be heard in a second of time, that there is still a difficulty of hearing the beats or waves when tuning a fourth or fifth, especially with a pianoforte, but that it is quite easy to detect the wave when tuning a unison. Now the thought has occurred to me, and I give it for what it is worth, that a safer, if not better result could be attained by amateurs like myself, if the following system was adopted. Take say C as a root, and tune one string of the dominant G as a perfect fifth, while the other is damped. When the interval is perfect remove the tuning wedge and bring the other string up to the one tuned until two beats are heard in a second of time. Mark *not* between the fifth and the root C, but between the two strings of the same note G. Having done so, flatten the string which at first was made a perfect fifth to C until the two strings are in absolute unison with each other and the result will be a properly tempered fifth. The plan I advocate is certainly not so rapid as the ordinary way, but why I suggest it is because the beats of the unison strings are so much plainer heard to the untutored ear than that of the beats made by a fifth with its root. But now I would ask Mr. Conolly whether I should do right in allowing two beats per second between the unison strings before finally making them alike, for it appears probable that if I were to lay the bearings I have here suggested, it would be incorrect for the following reason. The number of beats occurring in a given period in a properly tempered fifth with its root, and the number of beats in the same period between a string that is a tempered fifth, and one that is a perfect fifth of the same root, probably is not the same. That is the point on which I am not certain of, not understanding the ratio of the different vibrations sufficiently to determine for myself, I must claim Mr. Conolly's help and assistance. If, then, what I infer is correct, what I would wish Mr. Conolly particularly to state, so that I can at least give my plan a trial is this: How many beats per second should be heard between a perfect and a tempered fifth, fourth or third of any root. By so doing, Mr. Conolly will greatly oblige me, and doubtless many readers of AMATEUR WORK. I trust that my letter will not be considered too long for insertion, for it treats on a point of tuning which is to amateur tuners just what the fifth proposition of the First Book of Euclid is to a school boy—a regular *pons asinorum*."

Amateur's Eccentric Chuck.

E. T. B.—I hope that a paper under this title will appear in an early Part of this Magazine, and I trust that the directions given will meet your requirements. If, however, money is no object, I would recommend you to look at some of the American chucks of this description by first class American makers, such as Horton and Cushman, which, if costly, are good and reliable, or go to our own Britannia Company, *Colchester*, who will supply you with something in this way well worth having.

Additional Pedals for Harmonium.

SHODOONKEH.—You will find full instructions for adding pedals to large harmonium in the instructions given to ORGANIST in page 546, Vol. III. With regard to the small harmonium, you cannot add more reeds because you would not have sufficient wind.—A. J. (*Clapham*).

Shellac Varnish.

C. H. L. (*Stroud*), sends the following recipe for making shellac varnish: "Crush a small quantity of orange shellac rather fine and put it in a bottle, pour in the naphtha, cork up, and let the mixture stand for about twenty-four hours when it will be ready for use. Only sufficient naphtha should be used to render the varnish rather thick after the shellac is dissolved. The varnish will do for wood and metal patterns.

The Blue Printing Process.

H. S.—I am glad to find that experience has already proved to you that good prints can be obtained by you, though at first you wrote the process down as a failure. Surely by this time you have learned that a very small quantity is sufficient to cover a sheet of paper, and this I really cannot tell you more explicitly than I have already done. As to change of colour in liquid in sponge, if several sheets are done at the same time, there will be no perceptible change if instructions are followed out, but if you leave any quantity in the sponge then, of course, the light will affect it.—G. D. C.

Mounting Bats.

SOFT JACK.—If a state of repose is desired, model the back and roof of case to represent rock, colour with sombre tints (as the retreats of bats are always dark), ornament with dark moss, and perhaps a small sprig or two of ivy, and hang the bat by its claws, head downwards, with folded wings. But the bat will be more effective if shown as if in pursuit of its prey. In this case the wings should be extended, the mouth open, and the ears, if it is of the long-eared kind, erect. It should then be suspended by fine wires from the top of the case. Since bats delight in flying over water, where they drink on the wing, the bottom of the case may well be imitation water, *i.e.*, looking-glass, edged and backed with dark leaves and mosses. Nocturnal insects, such as beetles and moths, will be in keeping. The whole interior of this case should be kept sombre in tone.—G. W.

Varnish for Coil.

C. H. L. (*Stroud*).—1. If you are quite sure that you are winding the wire for your coil in the right direction, the shellac varnish will be quite suitable, but I should not recommend it to be used as it is almost impossible, unless with great loss of time and trouble, to get the wire off the coil to repair any faults in the wire, disconnection through overheating, etc. I think paraffin wax (or the ordinary paraffin candles) the best insulator that can be used, its insulating qualities are fully equal to those of shellac, and the coil can always be undone to repair any faults in it. It is used hot and laid on each layer of wire on the coil with a brush, so as to soak through the covering on the wire to the layer underneath. 2. There is no other way of annealing brass and copper than by making red hot and plunging in water. Burning can only be prevented (as far as I am aware) by keeping the wire in a case, iron or copper, and keeping it closed so as to prevent access of air. 3. I hardly think a paper on wire drawing would be of great interest to the majority of our readers, as wires of any common metal or alloy may be obtained of any thickness, annealed or otherwise, at a cost which would put it far out of the reach of an amateur to compete with. A paper on wire working would, I think, be most acceptable.—LEBASI.

Cutting and Polishing Pebbles.

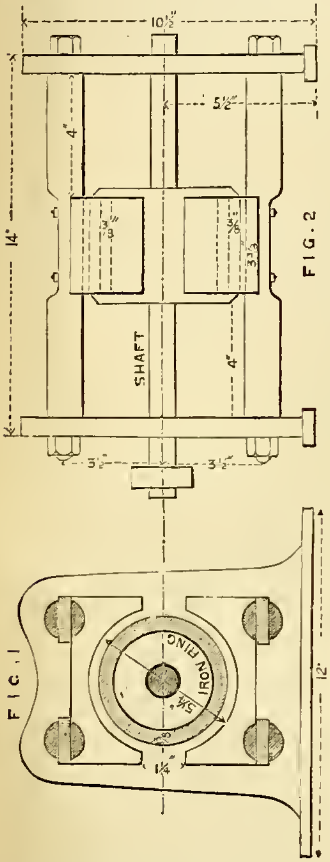
G. F. M. (*Llantrisant*).—I am pleased to be able to say that I have received a letter from R. W. F. (*Newcastle-on-Tyne*), explaining that the communications from J. N., and the lapidary to which I referred in Vol. III., page 592, were never received by him, and therefore they must have been lost in transmission. I can only sincerely regret that I imputed discourtesy to R. W. F. under the belief that my letter had reached him, and that my request had been disregarded, and trust that this may meet the eyes of J. N., and that he will again forward the information which you, R. W. F. and U. N. (*Uckfield*), desire to have. I have already given the addresses of those who make and supply "Spencer's Instantaneous Polish," and "Le Page's Carriage Glue," to others who have inquired for them, and these you will doubtless have seen and read long before this comes under your notice. Meanwhile if you and other correspondents who are in difficulties of this kind will consult the index to Vol. III., especially the portion devoted to "Notes on Novelties," and the Analytical Index to "Amateurs in Council," which I prepared myself, you will in all probability light upon information respecting addresses, etc., in very much less time than you can get it from me.

Wood for Carving.

NOVUM SARUM.—You will in all probability get the curled maple or sycamore you require for carving from Mr. Thomas J. Syer, 1, *Finsbury Street, Chiswell Street, London, E.C.* If he does not keep it, he will tell you where you can get it. You can apply also to the foreign hardwood merchants mentioned in reply to EGROEG, Vol. III., page 592.

Small Dynamo Machine.

FESTINA LENTE.—The best type of machine for actual use in lighting up six ten-candle incandescent lamps would be one with an armature constructed on the Gramme principle, or one of its modern modifications, such as the Schuckert or the Pilsen armatures. The annexed sketch, culled from the columns of a contemporary, seems to illustrate such a machine as that required by you. The iron ring, or barrel, of the armature is $4\frac{3}{8}$ inches in diameter, $3\frac{5}{8}$ inches wide, and $\frac{5}{8}$ inch thick. This is to be wound with 4 lbs. of No. 18 wire divided into twenty or more coils—the greater the num-



SMALL DYNAMO ENGINE.

Fig. 1.—End Elevation. Fig. 2.—Side Elevation.

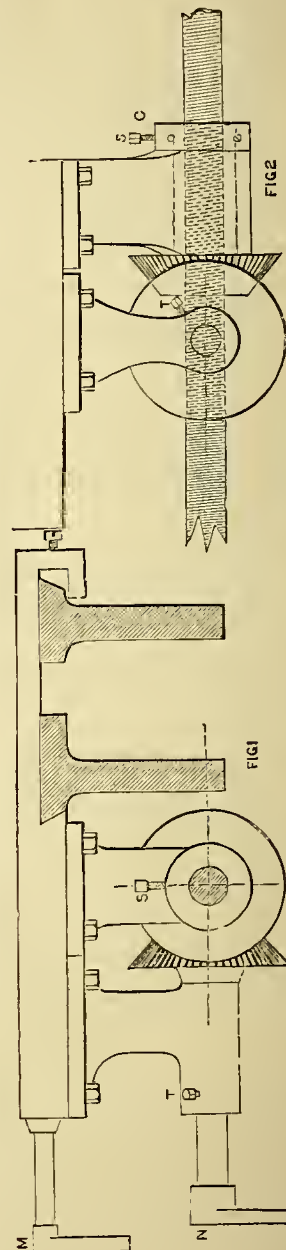
ber of coils on the armature the better the machine will work. The field magnets should be wound with 12 lbs. of No. 18, and connected to the armature on the shunt principle. The dimensions of the various parts are given on the sketch. It will take about one-horse power to work such a machine.—G. E.

Dissolving Gold.

SHODOONKEE.—Cut into small pieces, and immerse in a heated solution of aqua regia, prepared thus: Mix together in a thin glass beaker, or in a stoneware jar, one measure of pure nitric acid, three measures of pure hydrochloric acid, and one measure of distilled water. Keep up a gentle heat until the gold has dissolved, then drive off excess of acid by evaporation. The resulting ruby red crystals will be those of auric terchloride, $Au\,Cl_3$; these will readily dissolve in distilled water. Use 4 fluid ounces of the acid mixture to dissolve 1 oz. of gold.—G. E.

Self-Centring American Chucks.

A. F. S. (*Dresden*) writes:—"Your correspondent in condemning American jaw chucks, in page 593, Vol. III., has made a considerable mistake. He will probably accuse me of being a turncoat, for I wrote in the discussion in the 'English Mechanic.' I can agree in condemning the lever chucks in general, but some are better than others. I have two American chucks: my largest being only American pattern, for it was made in London. It is a lever one. I have had it nearly three years, and though it has been in use several times, it was only a few weeks ago that I discovered the way to make it hold. I find the first cost of lever chucks is as a rule dearer than that of key chucks. I do not think it possible that anyone can find fault with my larger jaw chuck as far as centring goes. That these chucks can be made satisfactory, I am certain, because the sewing-machine factories here use them, and if the chucks were useless, what a lot of bad sewing-machines there must be, as one factory turns out nearly one thousand a week. If it was not for the roughness of the common workmen, every lathe-maker here would use them; but the workmen are not lambs. One mechanist told me that he had one screw of one bell chuck of each lathe, broken every week. I cannot agree to the remark that an amateur cannot make a scroll chuck. Of course a little ingenuity would be required in rigging up band gear, for making the slide-rest travel across. But a self-centring chuck need not have a scroll. If any reader cares to try his hand at making one, I shall be happy to give instructions. The tool required to cut the teeth on the jaws of scroll chucks is, I fear, beyond the making of ordinary amateurs. It is a pity there are no importers of German tools in London. I have just seen some capital little shaping machines made to stand on a bench. They are of a novel pattern, and the sliding head, together with the cross slide, are made to rise about 5 inches in the smallest size; the vice pulls out, and can be turned over on either side. They have self-acting horizontal feed. They are worked by rack and lever. They are made at Baden, but I saw them at an exhibition here, and they struck me as being the very thing for amateurs, as they are very portable. They all have a stroke of about 7 inches. I append a sketch of a rotary nut for screw-cutting lathes. I think it would be useful to amateurs who may make a screw-cutting lathe, as it does away with clutch nuts and racks; and a lathe fitted with the rotary nut can, with the addition of two gear wheels, be made into a surfacing one. Lathes fitted with these nuts are made by Petschke and Glöckner in Chemnitz. These lathes are from 9½ inch to 18 inch centre, but this will have little to do with the nut. By screwing down the set screw S, and adding gear wheels on M, N, the lathe becomes a surfacing one. By



ROTATORY NUT FOR SCREW CUTTING. Fig. 1. —Front Elevation. Fig. 2. —Side Elevation.

loosening the set screw, and turning the handle N, the saddle moves as with the rack. By tightening the screw T, the lathe is set for screw-cutting. The nut is kept in place by the collar C, which is screwed on with three screws.

Making an Umbrella, etc.

J. S.—I think you will find it cheaper to buy than to make an umbrella. If anyone will send me a paper on Umbrella Mending, I will gladly use it if it be up to the mark. I am also waiting for a volunteer to write on Basket Making and Repairing. It is a subject that has been frequently asked for, but I have not yet met with any amateur or professional that can or will write on it. I have a capital series of articles on "Clock Repairing" in preparation, which, I hope, will soon be commenced. I trust that you and other readers who desire certain subjects to be treated, will understand that they are kept waiting, not through want of will on my part to give them what they wish for, but through delay in meeting with those who can take the subjects in hand, and handle them in an efficient manner.

Magic Lantern Slides.

L. M. — Small coloured pictures for magic lantern slides can be obtained from Messrs. J. Barnard and Son, 233, *Oxford Street, W.* These chromo-printed pictures can be transferred to glass by a process which is fully explained in a little work, "On the Use of Chromo-Printed Pictures," price 6d. The designs are sold at 5s. per sheet, and special materials are sold for the process, which will cost you perhaps as many shillings more.

Copper-Plate Printing.

F. E. L. (*Newbury*).—This subject has not been treated in AMATEUR WORK, and I cannot at present say whether or not it will be taken up: not at present, at all events. The method of making mould and matrix for typefounding has not been described. You will find papers on "Bookbinding for Amateurs," in Parts 6, 8, 10, 12, 16, 18, and 21. Another correspondent writes under the nom-de-plume AMICUS, and to prevent confusion, I have answered you under your initials.

Study or Library Table.

T. B. T. (*Carnew*).—You will find a very good example of a table suitable for a library or study in Part 33 of this Magazine, or, to be more exact, in Vol. III., page 459. The article is copiously illustrated with working drawings, some in the text and some in a folding sheet. The upper part of the table is exactly like the diagram you send, but the arrangement is far more convenient than yours, because you put only three drawers in the spaces on either side of the table from the top to the ground, and these would be very deep—too deep, indeed, to be convenient. As I have so recently given a good design for a library table, I cannot well give another yet awhile; but if you are determined to construct yours on the lines of your sketch, you can easily adapt the design mentioned above to your purpose.

Cost of Binding "Amateur Work."

T. B. T. (*Carnew*).—Cloth cases for binding this Magazine are supplied at 2s., or 2s. 2d., post free. A bookbinder would charge about 1s. for putting the parts in the case. You might get each volume bound in half calf, plain, for 2s 6d., and in half calf neat, for 3s. When the term "plain" is used, the binder means calf back and corners, with gold fillets, and lettered; by "neat" he means calf back and corners, sprinkled edges, and burnished raised bands, with gold line on each side of bands.

Gas and Air Blow-pipe in Brazing.

PHYSETER.—Any gas blow-pipe, or, in fact, any arrangement for brazing steel, which causes scale, damages the quality of the steel more or less. The parts of the steel exposed to the flame may be protected to a certain extent by covering them with a thin layer of soft soap, except on the surfaces to be brazed. The best solder is an alloy of 13 parts copper, and 11 parts pure silver. This alloy is as fluid as water when melted, and will make a butt joint on a steel wire, which will bear tying into a knot. Tempering steel for springs. This is commonly done by dipping the hard steel in oil or tallow, and slowly heating until the oil blazes. If the steel is bright, it can be heated over a gas-burner, a hot plate, or a clear fire, until the colour changes to a clear blue.—T. F.

Britannia Company's Lathes.

THE BRITANNIA COMPANY, *Colchester*, Manufacturers, General Engineers, Tool Makers by appointment to the British Government, wish me to state that the Prize Medal for lathes at the International Exhibition at the Crystal Palace was awarded to them.

INFORMATION SUPPLIED.

Black Varnish for Telescope Tubes.

LEBASI writes in reply to H. M. H.:—"Try a mixture of gold size, turpentine, and lamp black. Mix the gold size and lamp black to thick paste, and then thin with turpentine till satisfactory. I have had good results from it."

Compound Marine Engine for Model Launch.

A. F. S. (*Dresden*), writes:—"Permit me to ask S. M. L. (*Goderich, Canada*) to let me know the result of his compound engine, if he makes one. I have never known a compound engine model to work yet. It seems to be an impossibility. The pressure required would be very high, say 90 pounds. In this case I should not like to make the boiler myself; of course, he can make an engine with cylinders of different diameters, but I fear the expansion process must be left out. Surely S. M. L., if he has a few illustrated catalogues, can find the sort of engine he requires. This also applies to his next question. I do not understand whether he requires the boiler for a boat or not, and whether charcoal or spirit. If charcoal, make it 9 inches long, 5 inches wide, 6 inches deep, and make the furnace 6 inches long, 4 inches wide, 3 inches high, and put in ten or twelve $\frac{3}{8}$ inch tubes. The plates, if $\frac{1}{16}$ inch thick will bear about 30 pounds per square inch without stays, but for my part I should put in a few stays $\frac{1}{4}$ inch diameter, half dozen would be enough. Do not suppose (as some do) that the boiler is useless if the fire does not burn immediately. I have charcoal burning boilers with furnaces $2\frac{3}{4}$ by 3 inches and $\frac{5}{16}$ inch tubes, the furnaces vary from 5 inches to $5\frac{1}{4}$ inches long. They burn well, in fact rather too well, as I am always putting on fresh charcoal. One 7 inches long by 4 inches wide by $5\frac{1}{4}$ inches deep, will work a launch engine 1 inch by 1 inch or a paddle engine with two cylinders $1\frac{1}{8}$ inch stroke, $\frac{3}{4}$ inch bore; this will give him some idea of size of boilers. I do not give any sketch, as I think it would be asking too much of the editor to engrave about half a dozen drawings which would occupy two or three pages (far too much space) of 'Amateurs in Council.'" [I quite agree with you.—ED.]

Old Red Penny Stamps.

J. S. (*Lanark*), writes:—"In reply to C. G. H. C. (*Penge*), if the stamps (I suppose they will be postage stamps) have never been kissed by the defacing stamp of the post office, then they will be of great use to stick on letters, but as C. G. H. C. says he has thousands of them, he had better take them to the post office where he will receive full value for them, minus two and a-half per cent., but if they have been defaced then I'm afraid they will be of no use whatever." [I am afraid that J. S. (*Lanark*), did not read the question that was put by C. G. H. C. (*Penge*) very carefully. If he had done so he would have seen that it referred to used stamps. Further, his ideas of *meum* and *tuum* seem rather hazy. We shall find him sending "conscience money" to the Chancellor of the Exchequer one of these days.—ED.]

LEBASI writes in reply to C. G. H. C. (*Penge*):—"Keep them about 20 or 30 years and they might be valuable to stamp collectors, but I do not think you can do anything with them except pasting them on the walls in regular patterns, or ornamenting (?) boxes with them. If this won't do, sell them for old paper, or burn them."

W. F. M. (*Kilburn*) writes in reply to C. G. H. C. (*Penge*)—"That he has seen old penny stamps utilised for making snakes by threading them on thin wire or string to any length that may be desired. For the head of the snake a piece of cork is cut to shape, with a strip of red flannel inserted for the tongue, and two beads stuck in the cork with pins for the eyes. A small piece of American cloth is appended for the tail. The stamps can be cut small towards the tail end, so as to make the stamp-snake more taper in form, and therefore more like the shape of a snake. It is a curiosity, and looks very pretty when done."

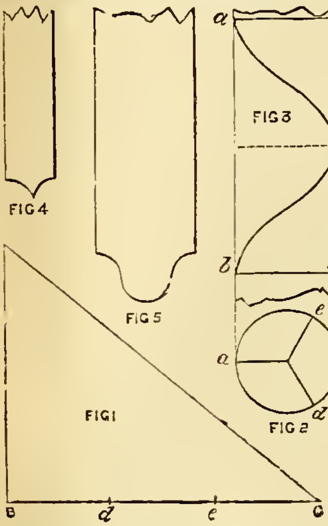
Articles in Glass Bottles.

L. M. writes in answer to A LAME MILLER OF NORWICH: — "I have a similar bottle. The pedestal, which is in the form of a cross (Maltese), is made in two pieces, fitting into each other. The centre cross fits in the bottom of the pedestal. The arm is separated and fits in a groove. Towards the bottom of the cross two swords are fixed by a wooden peg in the centre, these can be pulled flush with the cross or extended as desired. On the upper part of the cross two similar pieces are fixed also by a peg at the top, these also can be extended. The bottom of the ladder fits on to a portion of the pedestal on the other portion, to the left and right

of the centre cross two tall spikes fit into holes. When taken ont of the bottle tbere are seven separate portions. I may add that I purchased the bottle and contents of a man conditionally that he took it to pieces and put it together again, which he did in about fifteen minutes. The only tools he used were a straight piece of wood to push with and a piece of stiff wire slightly bent at one end to pull with. The water is used for two purposes, viz., to swell the wood and keep the portions in their places, also to magnify. My bottle is an ordinary 'Worcestershire Sauce' one, large size, with a long and very narrow neck."

Spiral Twist.

K. Q. writes in reference to this snbject (see page 549, Vol., III.:—"Turn your cylinder the required length, and with a pencil mark off the distance *a b*, equal to the pitch of the screw, then take a sbeet of paper, card, or thin metal, aud cut it to a



SPIRAL TWIST.

Fig. 1.—Gauge for tracing Spiral. Fig. 2.—Cylinder in Plan. Fig. 3.—Cylinder in Elevation. Figs. 4, 5.—Finishing Tools.

right angle at B, fold it round the cylinder, making the line B C coincide with *b c*, marking off the point where the ends meet, which will be the circumfcrence of the cylinder. Draw the line *a c*. If this is wrapped round the cylinder, its diagonal line will mark the position of the spiral. As there will be more than one spiral required, divide the line *a c* into any number you wish, as shown at *d e*. Mark off these points on the cylinder, aud sbift the gange rouud to each in succession. These lines only show the top or bottom of the twist. With a fine tenon saw make a cut about ⅛ inch deep all along the spiral. Get *some one* to tnrn the work slowly while in the lathe, so that you may have both hands at liberty. Then with a parting tool held steadily, you will get a tolerably good screw, which you can finish to the desired shape with a tool after the fashiou shown iu Figs. 4 aud 5.

Black Varnish for Telescope Tubes.

D. B. A. (*Finsbury*) writes in reply to H. M. H.:—"I have fouud gas or lamp black mixed with water and ordinary size do for similar pnrposes—*e.g.*, inside of a photographic camera, thongh I do not know whether this is what is nsed by telescope makers. It dries dead, *i.e.*, without gloss."

Organ Keys, their Price, etc.

J. H. (*Clifton*), writes:—"In reply to W. W. (*Norwich*), I should think he might obtain what he wants from Mr. T. R. Willis, 29, *Minories, London.* I see his price for organ keys is from 48s., 53s. to 60s. per set, and he could obtain anything he wanted in organ building at his factory, windchests, soundboards, keys, pedals, etc. I give the addresses of several organ builders which may possibly be of nse to some readers who are at a loss to know where to apply to for organ building materials in addition to the one above named, viz., A. Monk, *Great College Street, Camden Town;* Hill & Son, *Camden Town;* Bishop & Son, Gray and Davison, Bryceson & Co., all in London; Conacher & Co., *Alfred Street, Huddersfield;* J. Porrit, *Leicester;* J. Halmshaw & Sons, 193, *Camp Hill*, and Sames & Sons, *Suffolk Street*, both in *Birmingham;* Stringer & Co., *Cauldon Place, Hanley;* and J. Nicholson, *Palace Yard, Worcester.*

T. H. R. also writes that W. W. (*Norwich*) can get organ keyboards from Mr. Thomas R. Willis, 29, *Minories, London.*

A. E. (*Llandudno*) writes in reply to W. W. (*Norwich*):—"I have pleasure in stating that for a small organ which I have recently built for myself, I purchased a row of keys, 21 inches long, 56 notes, CC to G, bleached ivory, celluloid fronts, eased, baized, and fitted with key slip, for 45s. The frame is of plain walnnt. (The packing and railway carriage came to abont 4s.) Makers, Sebright and Clark, 16*a*, *Grafton Crescent, Castle Road, Kentish Town, London, N.W.* More expensive style and materials would, of course, increase the price. Reference to a London directory will give W. W. several names of key makers.

Design for Card or Cigar-Case in Fretwork.

HARLEQUIN writes:—"In reply to GALLIA's inquiry in pago 596, Vol. III., for a design for Gentleman's Card or Cigar-case, I beg to say that Mr. Henry Zilles, 14, *South Street, Finsbury*, can snpply him with a very artistic design for cigar-case, note-book, and cover of an album on one sheet, and the whole alphabet (miniature) and handsome book-cover in another sbeet, which will enable him to cnt ont the initials F. W. M., or any other letters he may require, and place them on the front of either cigar-case or note-book. GALLIA had better write to Mr. Zilles for prices, etc.

Waterproofing Textile Fabrics.

BING writes:—"If SCOTCHEE will communicate with me confidentially stating what he requires, etc., I think it would be to his advantage." [If SCOTCHEE will send me an envelope stamped and addressed to himself, BING's address shall be forwarded to him, or if he will send me a letter for BING in an envelope duly stamped for transmission by post, I will address it and forward it.—ED.]

C. W. C. (*Spondon*) writes:—"In reply to SCOTCHEE's query about waterproofing textile fabrics, I send recipe cut ont of back number of *Field* newspaper, which may be of some service to qnerist. 'We snppose yon mean the alum and sugar of lead recipe, for waterproofing cloth. It is as follows: Dissolve 2 ounces of sugar of lead in two and a-half gallons of boiling water, and 4 ounces of alum in a like quantity of water. When the solutions are cold dip the article into the first and hang it np to drip; when nearly dry dip it into the alum water, and then hang up to dry, but not near a fire.' "

Support for Wood in Fret Sawing.

G. T. W. P. writes:—"In answer to enqniry of M. E. L., in p. 551, Vol. III., I send description of an appliance that I have found very effective. My cutting-board is of the shape shown in Fig. 1, and placed as shown at the corner of a table, I myself

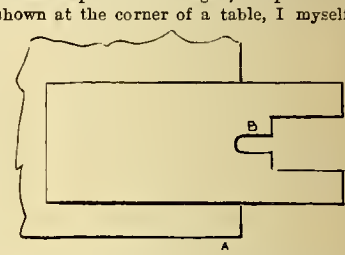


FIG. 1.—FORM OF CUTTING BOARD.

sitting at A. The narrow part marked B is intended to receive that part of the saw-frame which is between the lower screw and the shoulder of the handle, as shown in Fig. 2. By this means the saw-frame can be held in a horizontal position while moving the saw. Of course the top screw is the one to be

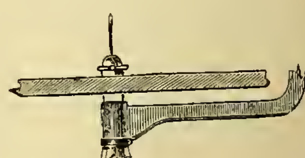


FIG. 2.—SAW FRAME IN NOTCH IN CUTTING BOARD.

loosened, and the wood has to be raised up to insert the saw. The npper arm of the frame can then be pressed down with the left hand, while the right hand screws it tight. When, in order to use up brokeu saws, I have loosened the screw in the handle, I support the end of the bow on my knee. By sitting in the position indicated I find I am most conveniently placed for adjusting the saw, etc. The under sides of the notch B should be sloped so as to fit the frame in any position of the flat head of the screw which fixes the saw."

Paper Roofing Material.

DELTA writes:—"I notice that FRANK ST. CLAIR says he finds roofing felt is not durable, and thinks of snbstituting paper. I think he cannot have given the felt a fair chance. Let him give it two coats of Archangel tar put ou hot, immediately after the felt is laid, and a coat of hot coal tar twice (or a least once) every year afterwards. If he does tbis he will not have to complain of want of durability. Unless his roof is very large, 1s. a year would cover cost of maintenance."

INFORMATION SOUGHT.

Binding Books by Wire Staples.

A Resident in the Highlands wishes for information on the method adopted for binding books by wire staples.

Fairy Bells.

F. E. R. (*Portsea*) asks for instruction "as to the size and proportions of an instrument called Fairy Bells."

How to Clasp Broken China.

A Resident in the Highlands wishes for "two or three sentences on this art, explaining especially what drill to use for boring china, where to get it, and how to insert the clasps."

Micro-Photography.

H. H. B. (*Reading*) writes:—"I wish to ask your advice in regard to the photographing of microscopic objects. I place the object in the microscope, then place the instrument at right angles, and put the camera as close to the eye-piece as possible and remove cap for second or so, and take a photograph as in ordinary way. But this method entails great disadvantages. I want to know if it would be possible to make use of a lantern and artificial white light. Could I adjust my microscope with the lantern in any way so as to get a magnified object on a white screen, and then could I photograph that object, for it is such a great trouble to keep all light out of the camera, except just what comes through the microscope. I do not quite see how to adjust the microscope and Lantern." [I dare say some of our amateur photographers will help you. I may say that you will find papers on the subject in the current volume of the "British Journal of Photography," published at 2, *York Street, Covent Garden, W.C.*—Ed.]

Bell for Metronome.

F.C.A. writes:—"Possessing a metronome minus a bell, will you kindly tell me the best means of fixing a bell to it? As many of your subscribers are musically inclined, no doubt, and this will be of general interest to many besides myself, will you kindly answer this as explicitly as possible?"

Boot and Shoemaking.

G. P. (*Manchester*) wishes to meet with some one resident in Manchester who will give him lessons in boot and shoemaking. He also expresses a wish that a school of amateur mechanics should be started in Manchester similar to the Finsbury School of Amateur Mechanics, conducted by Mr. T. J. Syer. [Go to work yourself. Make your views known to your own friends and acquaintances: they will communicate them to others, and so the circle will widen, and you may soon get a few amateurs together who are animated with desires similar to your own. You can then form a club. Take a room, buy a few necessary appliances for general use, and engage a skilled artisan to give the necessary instruction. Small beginnings often have great endings; and be sure that wherever there is a will there is a way.—Ed.]

Cement of Plaster of Paris and Varnish.

F. C. A writes:—"I want to know how to make a good cement with plaster of Paris and varnish, and what sort of varnish to use? I want it to dry in about two or three hours. I have tried copal varnish and plaster of Paris, but the natures do not seem to agree, and consequently will not mix well together. I wish to use plaster of Paris, or some good substitute, so as to form a good body, which *must* be nearly or quite white." [For what purpose do you intend to use the cement you require? This should have been stated. I do not know of any cement made of the materials you mention, but if you require an impervious cement for apparatus, etc., you can mix zinc white and copal varnish to fill the interstices, repeating the application until they are filled up, and then give a final coating of copal varnish.—Ed.]

"Union" Emery Grinders.

M. A. wants to know whether the small "Union" Emery Grinders will supply the place of a grindstone in the amateur mechanic's workshop where space is a consideration? Are they run at a very high speed, and what lubricant is used?

Reconstruction of Organ in Parish Church.

Clergyman (*Burton Fleming, Hunmanby*) wishes to know if any amateur organ-builder will assist him by giving advice with regard to the instrument in his parish church, which he thinks might be greatly improved by being reconstructed with alterations and additions. It was built in 1841: some of the working parts are much worn, although there are no signs of actual decay. GG compass, 58 notes, no GG sharp, 7 stops, Open Diapason, very mellow, lowest octave in wood, Stopt Diapason Bass, Stopt Diapason Treble, Principal, upper metal, lower wood: Fifteenth, Cornet, Sesquialtra, these two similar to a mixture of three ranks. There are no pedals. The bellows have a single feeder; not hinged at one end, but raised in the middle by means of a lever with arms, which passes beneath the sliding key-board and above the reservoir. They often cause a shaking noise, and are very heavy to work. The wind-trunk is at the bass *end* of the wind-chest. The large wood pipes, with four metal ones of the Open Diapason, are planted off the sound-board at the back. The whole is enclosed in an oak-grained four-sided case, with 20 imitation show pipes in front, gilt, 5 feet 7 inches wide, 4 feet 4 inches deep. Suggestions will be much valued.

Rocking-Horse on American Principle.

Whittlesford wishes for instructions for making a rocking-horse on the American principle.

Grooving Tool.

J. H. (*St. Helen's Road*) wishes for a description of the best grooving-tool, for grooving on end of wood, say a groove a $\frac{1}{4}$ inch wide and 1 inch deep.

Facing-up End of Roller in Lathe.

J. H. (*St. Helen's Road*) desires to learn the best and quickest way to face-up end of roller (wood 7 or 8 in. diameter) in lathe.

Fulminate of Silver.

J. H. (*St. Helen's Road*) wishes to be informed where fulminate of silver can be purchased.

Small Oval Chuck.

J. H. (*St. Helen's Road*) asks if Mr. Lukin or Mr. Durrance would give a sketch of small oval chuck for turning lengths of wood 30 inches long and $1\frac{1}{4}$ inch diameter; or describs a substitute for the said chuck.

Small Water Motor of French Make.

J. R. (*Manchester*) wishes to know where to purchase a small Water Motor of French make, as he is unable to get one in Manchester.

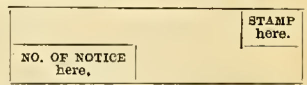
SALE, PURCHASE, OR EXCHANGE.

Persons availing themselves of this Department of Amateur Work *are requested to note that—*

(1) *No Trade Advertisements can be inserted in this Department, which is open to bonâ fide Amateurs only. The Editor reserves the right of refusing to insert any notice.*

(2) *No charge will be made for the insertion of notices until their number be such as to render it absolutely necessary to do so.*

(3) *Persons writing in reply must forward application under cover to the Editor, in an envelope sealed down, with a Penny Stamp attached in the upper right hand corner, and the* Number *of the notice in the lower left hand corner thus:—*



(4) *Letters thus marked and enclosed under cover to the Editor will be forwarded immediately to owners of articles for Sale or Exchange, or persons wishing to purchase. No attention will be paid to any communications in which these Rules are not strictly observed.*

145. Organ Pedals, radiating concave, 29 full size, notes of birch, with deal stool. Price £2 10s.

146. Special Express Bicycles.—(1) 84-inch, complete, with lamp, spanner, etc. £3 10s. (2) 50-inch, complete, with odometer and lamp, £4 4s., or will exchange for Photographic Apparatus.

147. Tourist Bicycle, with lamp, etc. £2 15s., or will exchange for Photographic Apparatus.

148. Steam Gauge, 6 inch, up to 100 lbs., 5s., or will exchange for Photographic Apparatus.

149. Anvil, weight over 112 lbs., 12s. 6d., or will exchange for Photographic Apparatus.

150. Camera and Lens.—New for taking Gems, £2 5s., or will exchange for Photographic Apparatus.

151. Castings for Dynamo, with 8 lbs. No. 16 cotton-covered wire, and $\frac{3}{4}$ lb. double silk-covered wire, £1 5s. for the lot, or will exchange for Photographic Apparatus.

152. Nigger Bones.—One set, complete and good, 2s.

153. Siemens' H Armature.—A few sets of Castings, consisting of armature, $3\frac{3}{4}$ in. long and $1\frac{7}{8}$ in. diameter, and two gunmetal caps with spindle to fit on ends. 2s. per set.

154. Metronome.—Good, with arrangement for bell. Cost £1. What offers?

155. Dentists' Instruments.—Wanted, Forceps, and Scaling and Stopping Instruments. State price, etc.

156. Furnace, etc.—Wanted, Fletcher's Instantaneous Heater, Foot Blower, and Ladle Furnace. State price, condition, etc.

157. Boilers.—Wanted, Coil or L Boiler, with or without Pipes; also Copper Cylinder, with ornamental iron work and slate top for Hall. Price and condition to be named.

158. Rapin's "History of England."—200 numbers in original wrappers, beautiful engravings, in good condition. Cost over £6. Will exchange for Organ Materials, Pedal Board, Stop-heads, Pipes, etc., which must be good.

159. Castings for Engine.— Horizontal ¼-horse power, complete set, new and perfect; steam and exhaust port-holes cast in cylinder. Would drive lathe when fitted up. Cost 16s. 6d., will sell for 12s.

160. Printing Outfit. — Includes "Optimus" Press, printing 7 in. by 5 in., over 12 lbs Nonpareil and other types, type case, patent roller, metal composing stick, printing paper, etc. Price £2.

161. "Mechanical World."—4 volumes offered for 5s.

162. "Amateur Work." — Parts I. to XXXIV. inclusive, offered for 9s.

163. "English Mechanic."—5 volumes, 4 bound, leather back and corners, all clean, offered for 15s.

164. "Amateur Work" and "English Mechanic."—Parts I. to XXXV., inclusive, of former, and 106 numbers of latter, from June 9, 1882, to June 13, 1884, inclusive, all clean and perfect. What offers in cash, or in Heating Apparatus for Greenhouse, 10 ft. by 7 ft? If exchanged, each pay carriage of his articles.

165. Chamber Organ. — CC. Stops: 1, Open Diapason, Mid. C, 8 ft.; 2, Stopped Diapason, Treble, 8 ft.; 3, Stopped Diapason, Bass, 8 ft.; 4, 5, Principal, Treble and Bass, 4 ft.; 6, 7, Fifteenth, Treble and Bass, 2 ft.; 8, Flute, Mid. C, 4 ft. Case of Spanish mahogany, elaborately carved; three towers of gilt pipes; 8 ft. high, 4 ft. 2 in. wide, and 1 ft. 10 in. deep; foot blower, hand ditto easily added. Lately rebuilt and new bellows added by Gray and Davison. £11, or what offers?

166. "Outlines of Chemistry," Gregory, in perfect condition, cost 12s., will sell for 3s. 6d.

167. "Principia Latina," Smith, cost 3s. 6d., will sell for 1s. 6d.

168. Miscellaneous Books, rare, instructive, religious, and amusing, 32 in number; will sell for 5s., purchaser to pay carriage.

169. Organ Materials.—Nearly the whole suitable and required for a Two Manual Organ; 2 lots of keys, 2 soundboards, building frame, 6 stops of wood and metal pipes, good new bellows. Will sell for £5, cost very much more.

170. American Organs. — Two for sale, both quite new. No. 1, 6 ft. high, 3 ft. 9 in. wide, and 1 ft. 9 in. deep. Case of solid American walnut, sunk and moulded panels, 8 stops, 4 sets of reeds of 2½ octaves each, grand organ and knee swell. Price 15 gs. No. 2, 4 ft. 7 in. high, 3 ft 7 in. wide, and 1 ft. 7½ in. deep. Case, etc., as in No. 1, with sliding fall, 6 stops, 3 sets of reeds of 2½ octaves each, knee swell. Price 12 guineas. Money returned if found not to be as represented.

171. Six-inch Centre Lathe.—5 ft. bed of thick wood, iron faced; large wood flywheel and standards; compound slide-rest, 2 T-rests, Driver chuck, prong chuck, Bell chuck, 2 screw chucks, square-hole drill chuck, and face plate. Useful for metal or wood turning. The lot, £3 10s. (Locality, Great Yarmouth.)

172. Shooting or Fishing Punt.—New this year. 18 feet long, mast, sail, 2 pairs of oars, 1 pair brass rowlocks, 2 pairs iron do., boat hook, anchor, etc., in first-class condition. Will sell for £6. Can be seen by appointment. (Locality, Great Yarmouth.)

173. Small Lathe.—12-inch bed, turns 5 inches, and 7 turning tools, all in complete working order. Price £3.

174. Magic Lantern. — Lenses 3½ inch, compound condenser achromatic front, all mounted in brass work, complete, with tin front quite new and unsoiled. Price 18s.

175. Serial Publications. — "Good Words," for 1883, complete and quite clean, 2s. 6d. Also, five numbers of "Longman's Magazine," 1s 6d. Will take 3s. 6d. for the lot.

176. Tuning Hammer.—For pianoforte tuning. Price 3s. 6d., carriage free.

177. Organ Pipes.—Set of Stopped Diapason, wood, from Tenor C up, voiced and ready to put into organ. Scale suitable for Chamber Organ. Price 23s., purchaser to pay carriage.

178. "The Graphic."—All the weekly numbers, from commencement to present date, with many of the Supplements, in excellent condition for binding. Cost nearly £21. Will take £7 7s., purchaser to pay carriage.

179. Magazines. — "Harper's," for 1881—82, offered at 6d. per number; "Longman's," from beginning to present date, at 4d. per number; "Argosy," for 1882—83, at 3d. per number; "Penny Post," from 1881 to present date, at 7d. per year; "Sunday," July, 1883, to present date, at 1½d. per number.

180. Three Fret-Saw Frames.—No. 1, Wooden Frame, large size, in good order, cost 14s. 6d., will take 7s. 6d. No. 2, Small Steel Frame, almost new, cost 8s. 6d., will take 4s. 6d. No. 3, Larger Steel Frame wants straightening, will take 2s. Or will sell the lot for 13s. Purchasers to pay carriage.

181. Old Carved Oak Bookcases.—Two wanted, with glass doors above and cupboards below. Each to be 8 ft. high and 3 ft. 6 in. wide.

182. Sundry Books.—"The Spectator," Subscriber's Edition, 1745, 8 vols., complete; "History of Russia," 3 vols. (cost 18s.), by Dr. Lardner; "Greek-Latin Lexicon," by Dr. Schleusner (cost £3 9s.) All bound, complete and perfect. What offers?

183. Model Windmill, worked by clockwork. Price 10s., or will exchange. What offers?

184. Aquarium, very pleasing design. Will take 15s.

185. Self-Acting Fountain.— Will take 7s. in cash, or will exchange.

186. Flute, Blackman's Patent.—Four-keyed, perfectly new; German silver keys and mountings. Price 10s., or will exchange for good tools, etc.

187. Workshop Appliances. — Wanted, an American Ratchet, Brace Bits, a Bench Stop, and a Grindstone. (Locality, Dublin.)

188. "Design and Work."—Nine vols., perfect, newly and well bound in leather. Will sell cheap; offers requested.

189. Magic Lanterns.—No. 1 gives 7 ft. picture, brass sliding front, 12 comic slides, 1 lever slide, 2 shipping, 2 panorama, and 6 other slides, including 3 of Aladdin; only used three times. No. 2 gives 3 ft. picture, 12 slides in box. Will sell both for 21s. 6d.

190. Forty-eight Inch Bicycle.—Singer Extraordinary Safety; roller bearings, 16 each side; in good running order, with bag, bell, and "King of the Road" lamp. Cost £15 15s., will sell for £4 4s.

191. Castings for Engines.—Wanted, for (1) Horizontal Engine, 2½ in. bore, and (2) for Coupled Engine, with cylinders about 2 inch bore.

192. Fifty-four Inch Bicycle, by Andrews. — Hollow forks, bent T-handles, value £5, offered in exchange for first-class 7-stringed Banjo, or will sell for cash. What offers?

193. Compound Microscope.—Has coarse and fine adjustments, universal motion to stage, mirror, eye-piece, 3 powers, stand, condenser, hand forceps; nearly new. Price £2 15s.

194. Model Steam Engine.—Value 25s. All the parts except stand, and several other parts, offered in exchange for Fret Machine.

195. Small Magic Lantern.—Shows disc 3 ft. in diameter; 10 slides in box. Price 4s., carriage paid.

196. Magic Lantern.—Shows 5 ft. disc, with lens, lamp and reflector, complete; body somewhat knocked about, but lantern shows pictures well. Cost, when new, 13s. Also, 60 pictures, in good condition, comprising coloured photographs, movable slides, etc. Cost, when new, about 25s. Will take for Lantern and Slides 20s.

197. Various Books.—(1) "English Mechanic," Vols. 24—38. (2) Hand's "New Views of Matter, Life, and Motion," cost 5s. 6d. Cassell's "Technical Educator," 4 vols., bound. For sale, or part exchange. What offers?

198. Telescope, combined, by Theobald, as good as new cost 12s. 6d., for cash, or part exchange What offers?

199. Batteries and Wire —(1) Strong 6-cell Daniell's Battery for Electroplating. (2) Another Daniell's Battery for Lighting. (3) 2 lbs. Silk-covered Wire. For sale, or part exchange. What offers?

200. Enfield Rifle.—Good, with 150 Cartridges. For sale, or part exchange. What offers?

201. Electric Bell and Battery. — For sale or exchange. What offers?

202. Engineer's Tools Wanted. — Can offer various articles in exchange.

203. "Amateur Work."—Parts XII. to XXIII., being Vol. II., quite clean, price 3s. 6d. Also, Parts XI., XXII., XXIV., XXV., XXIX., price 3½d. each. Purchaser to pay half postage.

204. "Universal Instructor," Parts I. to XXIV., in exchange for Organ Music, Tools, Flute, or "Every Man his Own Mechanic."

205. Billiard Balls and Indian Clubs.—Set of three 2 inch Ivory Billiard Balls, in excellent condition, and pair of polished Indian Clubs. Will take 15s. cash, or exchange for a few well-bound standard works.

206. "Illustrated Exhibitor."—Two vols. in exchange for any article useful to an amateur. What offers?

207. "Amateur Work" and "Every Man his Own Mechanic."—Parts XVII.—XXXV. of former, inclusive and complete, and latter complete, in exchange for Fret or Carpenter's Tools or Battery suitable for small Swan Lamp.

208. Model Stage.—Complete, with large front, slides, lamps, side wings, top drops, etc., with play, "The Miller and his Men," including transformation and pantomime. All large size and ready for working. What offers?

209. Books on Watch and Clock Making.—Wanted to purchase; state cash price. [As letters in reply to this notice have to be sent abroad, a 2½d. stamp must be affixed to any and every answer.—Ed.]

Communications received and unavoidably held over.—C. B., D. B. A. (*Finsbury*), C. B. (*Tunbridge*), Nepenthe, Jack, D. W. W. (*Camberwell*), M. A., T. L. L., W. S. (*Whitchurch*), M C. (*à Condé, France*), A. F. S. (*Dresden*), Amicus, J. Y. (*Glasgow*), A Subscriber to Vols. I. & II., H. S. (*Salford*), H. Tims, Graham, W. L. (*Lisnaskea*), W. H. V. (*Stratford*), F. W. L. (*Walsall*), Lebasi, Olla Podrida, J. J. W. (*Burford*), A. B. (*Coutham*), J. B. (*Stonham*), Casenheen, J. W. S. (*Alston*), C. T. S. (*à Tiheu, Le Portal, France*), Parson, Sailor.

FIG. 5.
Back and Front
of Box.

FIG. 6.—Sides
for Lid.

FIG. 3.—Design for Top of Casket.

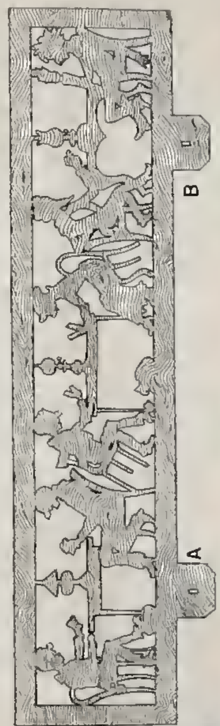


FIG. 7.—Sides
for Box.

FIG. 12.
Dovetail for
Sides of Lid.

FIG. 4.
Back and
Front of
Lid.

FIG. 1.—The Casket Complete.

DESIGN

FOR A

CASKET IN FRET-WORK

TO HOLD FOUR PACKS OF CAROS.

Designed for Amateur Work

BY

FRANK CROSBIE.

FIG. 10.—Centre Support for Casket.

FIG. 2.—Design for Base of Casket.

FIG. 8.—Female Figure for
Corner of Casket.

FIG. 9.—Male Figure for
Corner of Casket.

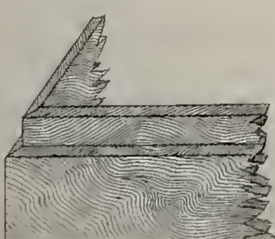


FIG. 13.—Collar for Lid of Casket
to fit on.

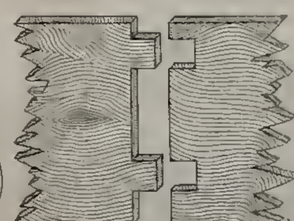


FIG. 11.—Dovetail for fitting
Sides together.

WARD, LOCK, & CO., WARWICK HOUSE, SALISBURY SQUARE, LONDON, E.C.

THE ÆOLIAN HARP, AND ITS CONSTRUCTION.

By BEECH.

THIS musical instrument received its name from the fact that its sounds are produced by the action of the wind upon its strings; and inasmuch as, in the heathen mythology, Æolus had the charge of the winds, it was called Æolus's Harp, or, as we now more euphoniously term it, the Æolian Harp.

So far as the actual construction of the instrument is concerned, there is not much to describe. The skill required is of the slightest, for it is only necessary that the reader should be able to plane up a piece of wood truly and make a fair dovetail joint. The wood used may be deal, but it will be more satisfactory if ash be used, as it will yield a greater resonance, or reinforcement of the sounds produced by the strings; this is on account of its being a better conductor of sound. Deal, however, is more convenient, on account of its being easier to work, and answers the purpose

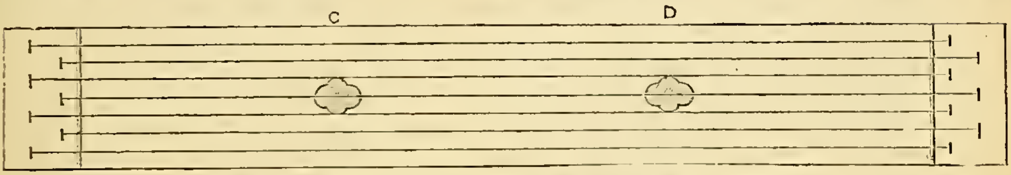


FIG. 1.—PLAN OF ÆOLIAN HARP. Scale, $1\frac{1}{2}$ inches to 1 foot.

About the year 1750 it was brought forward in London as an instrument which had been newly invented, and Dr. Anderson, in a footnote to Thomson's Ode on Æolus's Harp, ascribes its invention to Mr. Oswald, the composer of "the Scottish Songs." On the other hand, we have the Talmudical record, that the Kinnor, or David's Harp, sounded of itself when the wind blew upon it. We may infer from this, therefore, that it is most probable that an instrument of this nature was very anciently known. The credit of the invention, in the form it now takes, is due to Athanasius Kircher. This noted philosopher was born at Geysen, in 1602; he was a man of extensive learning and research, and wrote many works on mathematical and physical sciences. In one of his works, the "Musurgia Universalis," Book IX., page 352, he gives a description of the instrument: "The Æolian harp is pleasant and easy to construct, and is heard in my museum, to the admiration of everyone. It is silent as long as the window in which it is placed remains closed; but when this is opened a sudden harmonious sound breaks forth, which astonishes the hearers, for they neither perceive whence it proceeds, nor what kind of instrument is before them, for the sounds do not resemble those of a stringed or of a pneumatic instrument, but partake of both."

admirably. It will, of course, be readily understood that the more carefully the work is performed, the more satisfactory will be the instrument when completed.

Prepare two pieces of wood, $4\frac{3}{4}$ inches wide, 6 inches long, and $\frac{3}{8}$ inch thick, for the ends, also two pieces, 3 feet 6 inches long, $4\frac{3}{4}$ inches wide, and $\frac{3}{8}$ inch thick, for the sides. Dovetail these together to form a box. For the top and bottom of the box, prepare two pieces, $\frac{1}{8}$ inch thick, 3 feet 6 inches long, and 6 inches wide, and fasten them on to the framework with glue and screws. Before fastening these down, however, it will be necessary to cut the two holes (C and D, Fig. 1) in the top or soundboard. This may be readily done with an ordinary fretsaw, but the holes should be cut clear, and not covered in any way with fretwork. This will allow a free exit for the sound from the sound-box. The next thing is to prepare the holes for the pegs and pins which carry the strings, and as it is evident that the top, in its present condition, is not strong enough to bear the strain, or even to hold the pegs, we shall require two pieces of beech (as shown in Fig. 2, A and B), 1 inch thick, $5\frac{3}{4}$ inches wide, and 3 inches long, which are to be glued and screwed to the top piece after it has been screwed down on to the framework. It will also be necessary to run

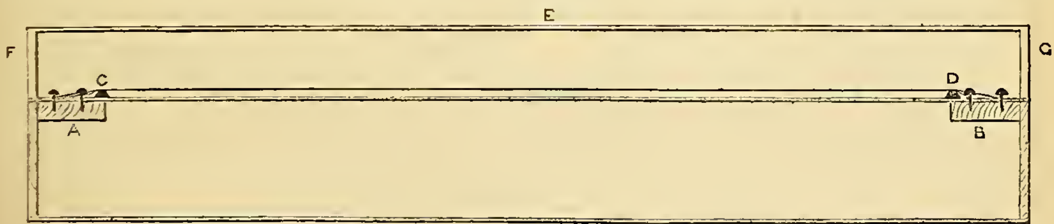


FIG. 2.—SECTION OF ÆOLIAN HARP. Scale, $1\frac{1}{2}$ inches to 1 foot.

screws from the sides and ends into these pieces. Before gluing the top on, so as to get the exact position, mark the places where the pegs are to come, and, with the brace and bit, carefully bore the holes. Then fasten down the top, screw and glue on the under-pieces, and fasten the bottom on with screws and glue. The pegs, which are of hard wood, and can be procured at most shops where musical instruments are sold, are simply the small pegs (A, Fig. 1) used in violins; the pins (at B, Fig. 1) are such as are used in pianofortes. On the front of the soundboard it is now necessary to place two triangle-shaped pieces of beech (C, D, Fig. 2), $\frac{1}{4}$ inch high, and $\frac{1}{2}$ inch thick at the base, and 3 inches from each end, to act as bridges to the strings; these should be slightly grooved at the top where each string passes, so as to keep them from slipping. The number of strings is immaterial, but in an ordinary harp we should not have less than are shown in Fig. 1, and, of course, the more strings we have the fuller and louder will be the tone. The strings themselves may be either of catgut, steel, or brass. The first of these is most commonly used on account of its being more readily obtained, and most easily affixed. It should be of the size of a first fiddle string (viz., the E string). One end of this is then firmly fixed to the pin (B, Fig. 1), and the other is passed through the hole in the peg (A, Fig. 1), which is then turned round, the end of the string being secured from slipping. It soon becomes tightened, and should be screwed up until the string sounds in unison with the note A (below the middle C) of a piano. The next string may then be fixed in the same way, and so on with the whole set until we have them all sounding the same note.

The harp itself being now finished, take a piece of wood (E, Fig. 2; deal will do) the size of Fig. 1, and fasten a strip of wood (F and G, Fig. 2), 3 inches long and $\frac{1}{2}$ inch square, to each corner. This is to place over the harp so as to form a conductor of the air over the strings.

To finish the instrument, we should now stain and varnish it, if we have made it of deal; if of hard wood, fill and polish it.

To use it, place it on the ledge inside a window, and draw down the window sash so as to rest on the upper board, or cover (E, Fig. 2), and the harp will discourse sweet music on the first motion of the air over its strings; to increase the force of this motion, an opposite window or a door may be opened. When the wind blows gently the strings sound in unison, but as the force increases the sounds change in a pleasant mixture of all the notes of the scale, descending and ascending, and these often join in the most pleasing combinations, making

"A certain music never known before."

The poet Thomson, in his "Castle of Indolence," describes Æolus's Harp as an instrument

> "From which, with airy fingers light,
> Beyond each mortal touch, the most refined
> The god of winds draws sounds of sweet delight.
> Ah, me! what hands can touch the strings so fine?
> Who up the lofty diapason roll
> Such sweet, such sad, such solemn airs divine,
> Then let them down into the soul?
> . . . .
> Wild warbling Nature, all above the reach of art."

INSTRUCTIONS FOR BUILDING A SAILING BOAT.

By J. STUART ELLIS.

II.—PLATE CASE AND PLATE—OBJECT OF PLATE—RIBS—GUNWALE—BREAST-HOOK—STOPPING LEAKAGE—STRINGERS—FLOOR BOARDS—GRATINGS—MAST—SAILS—OARS.

AT the end of my first paper, I gave directions for laying on the planking. I will now suppose that most important operation to be done, with a mahogany plank at the top. Of course, there is no use in having a different wood for this top strake, unless one means to varnish, instead of painting the boat. It always seems such a shame to paint a well-built pine boat. Varnish, on a good surface, makes the boat look quite another thing. The next thing to be done after the planking is the "plate case," this must be made with considerable care as it has to be watertight. In the preceding paper it will be seen that I advised my readers to hold the boat down to the trestle by bolts and nuts passing through the slot for the centre plate. On removing these, the boat must be propped up in several places on either side by pieces of wood from the floor. Figs. 14 and 15 show the plate and plate case in elevation and section. The sectional diagram shows the mode of fastening the "case" to the keel. This is done by cutting a rabbet $\frac{1}{2}$ inch deep and $\frac{1}{2}$ inch wide all round the top of the slot. The case must be rabbeted to fit this, and should be made of $\frac{3}{4}$ inch elm. The shape and dimensions can be got from the woodcut. It is further secured by wooden knees, or iron brackets fixed to the ribs. The plate should be of $\frac{3}{8}$ inch or $\frac{1}{2}$ inch galvanized boiler plate, and is swung, at the fore end, on a $\frac{1}{2}$ inch galvanized bolt passing through the keel *below* the boat. This allows the plate to be taken out at pleasure. The other end is attached to a chain or jointed rod 12 inches long, passing through the top of the case, where there is a handle. When the plate is up, a spindle can be pushed through one of the links of the chain, on the top of the case, thus preventing it from slipping down. The object of this plate is to prevent "leeway," and

it is absolutely essential to the good sailing qualities of the boat. I gave 14s. 6d. for my plate, but that was cost price. All joints about the plate case should have some whitelead put in before joining. So much for the plate case; now for the ribs. For these, a board, 6 feet long and 11 inches wide, of straight-grained English elm, must be got, and this must be cut up into strips $\frac{1}{2}$ inch by $\frac{3}{4}$ inch. Each one of these will form one rib round the whole, inside the boat, being nailed to the keel with stout galvanized steel nails, and through the overlap of each pair of boards as it crosses them, from the outside, with $1\frac{1}{2}$ inch copper nails. Fig. 16 represents half a rib. The ribs should be placed at intervals of 6 inches all along the boat, the $\frac{3}{4}$ inch surface being against the planks. As they near the stem or stern, the bend required is so excessive, that steaming, or soaking in hot water, will be found necessary to get them round. The two pairs nearest the bow and stern must be put in in two pieces for each rib. The ribs being in, our next job is to put the gunwale in. For this, two pieces of American elm, $1\frac{1}{2}$ inches by 1 inch, by 15 feet long, must be got. These must be planed up, and clamped along inside the top strake, and must then be nailed to it at intervals of about 4 inches with stout copper nails, from the outside. A piece of wood should then be put on to cover the join of the top strake and gunwale. Fig. 17 shows the section of the gunwale complete. For all boring into hard wood, such as the ribs, etc., a "boat-maker's awl" should be used: this can be obtained of any toolmaker.

To strengthen the bows, a piece of wood called the "breasthook" is now put in. Fig. 18 shows this, I think, better than I could explain it. C is a piece of oak or elm 1 inch thick; S is the stem-post in section; A, A, are the top boards; B, B, are the two gunwales; D, D, are two short stringers on to which C is screwed; and R, R, are the ribs. In the stern the gunwale is strengthened by two large wooden knees, one on each side of the transom board, on the inside. When these are in, the outside of the boat should be well sand-papered, and should then receive a coat of good copal varnish. Of this Chas. Turner and Co., *Broad Street, Bloomsbury*, supply an excellent quality. The boat must now be floated on any little piece of water which is handy, and the leaks carefully marked. I dare say the plate case will here be rather troublesome, but if the two bottom boards and the plate case have three coats of good paint on the inside, a good many small leaks will be stopped. Pitch should be used only as a last resource. This paint will all be covered by the floor boards. The boat must then be put back on the trestle, and the stringers on which the thwarts will rest put in. These consist of two pieces of American elm, 15 ft. long, by 1 in. by $\frac{3}{4}$ in. They are laid from rib to rib, the whole length of the boat at whatever height you wish to have the seats; they had better not be too high up, as the lower you keep the centre of gravity the better. Long nails will be wanted here, to go through the boards, rib and stringer. All nails must be put in from the outside. A second pair of stringers, 12 ft., by $\frac{1}{2}$ in. by $\frac{3}{4}$ in., should be put in about 9 in. up the side boards from the keel, this will be where the floor boards end: they prevent the floor boards from slipping. These floor boards rest on pieces of wood called "floors," of which Fig. 19 is an example near the middle of the boat. They should be 2 inches deep, above the keel, and must be cut to the shape of the boards. They should be made out of 1 inch elm, and placed 2 feet apart. The last floor in the bows and stern must be deeper, as the flooring here takes the form of two triangles, raised about $1\frac{1}{2}$ inches above the rest. Gratings, as shown at B, in Fig. 20, look nice, but are much more trouble to make than the two solid triangles. In Fig. 20, A is a triangle of $\frac{3}{4}$ inch elm, firmly fixed on to stringers, and having a rabbet, as shown by the dotted lines, into which B fits; the outer triangle of B is elm $\frac{3}{4}$ inch by $\frac{3}{4}$ inch, the horizontal cross bars are $\frac{3}{4}$ inch by $\frac{3}{8}$ inch thick; the vertical cross bars are let into these, but are only $\frac{3}{16}$ inch thick by $\frac{3}{4}$ inch wide. The whole is quite flush, and all the parts look the same width. A grating of this sort must be placed in the bows about 8 inches from the top—the altitude of the triangle being 18 inches. The mast is fastened to this, so that the outer triangle A must be very strong, and had better be about 3 inches wide.

To return to the floor boards. They must be $\frac{5}{8}$ inch thick, of pine, and are fixed to the floors. Get two 9 feet boards, 9 inches wide, and cut them into 9 feet lengths, $4\frac{1}{2}$ inches wide, two of these must be cut a little, to fit the plate case nicely. These boards should not be fixed permanently, as things often slip under, when one has to pull them up. During all these operations it will often have been convenient to get inside the boat; in doing this, one must take care only to step on the top of the keel. We must now put the thwarts in. The three best woods are mahogany, oak, and elm; whichever is used, a plank 8 feet long and 9 inches wide, and another 4 feet long and 12 inches wide must be got. Suppose we stand outside the boat at the stern looking towards the bow, take a rule and mark off 10 inches on each side, from the transom board towards the bows; draw a line at this mark all round inside the boat *parallel* to the ribs. This *piece* will be a locker, which will not only be very handy, but which will help keep the boat on an even keel. The next 12 inches will be our stern thwart or seat, the back to which will form the front of the locker. The top of this backboard should be about 3 inches below

the top of the transom which should curve a little above the gunwale, this enables one to have a place to scull over the stern, which is sometimes very handy. To make the top of the locker, two wooden knees must be placed on the backboard opposite the ones on the transom referred to before ; on these four knees, a frame should be laid and screwed down, this frame should be of $\frac{3}{4}$ inch stuff, about 2 inches wide, with a rabbet all round to allow the door to lie flush. This door should be hinged on one side of the frame, and have some kind of lock on the other. Ordinary locks soon get out of order at sea, so some simple fastening is better. If the locker is wanted water-tight, the backboard and that part below the stern thwart must be carefully joggled to the sideboards. The inside of the locker should receive two good coats of white paint, before it is built in. The stern thwart, which is made from $\frac{3}{4}$ inch by 12 inch mahogany, rests on the large stringers, and is screwed firmly to them with stout brass screws, two in each end ; it is further secured by having two wooden knees each end, which are fastened to the ribs. Fig. 21 shows these knees. H being the thwart, K the knee, R the rib, and A section of stringer. Now measure 4 feet 6 inches from the backboard, towards the bows, and put in the middle thwart at this place in the same way as the last. This one is only 9 inches wide. The last thwart must be put in 7 feet 4 inches from the backboard.

The stretchers should be made as shown in Fig. 22, at any convenient height. Swivel rowlocks are the best kind to get for such a boat as this, though of course thole pins would do ; these rowlocks must be fitted into the gunwale about 6 or 8 inches towards the stern of the two middle thwarts. In the bows we have the grating sticking out 18 inches into the boat, the mast box is fastened to this. The box itself should be made of $\frac{3}{4}$ inch elm ; it has only 3 sides, that toward the stern being opened to allow of the mast being easily stepped. The back of the box must be of the depth between the keel and the *underside* of the grating frame, and must be screwed to the two sides of the box. Two thin bolts and nuts had better be run through the box close to the back at top and bottom ; this box being placed against the grating frame, it will be seen that the *back* comes under it ; this must be screwed to the frame from the top. A piece of 1 inch elm, the size of the *inside section* of the box had better be screwed to the keel, and the box screwed to it through the sides. A $\frac{1}{2}$ inch bolt must be run through the middle of the box 1 inch above the keel top, this is used as a sort of hinge when raising or lowering the mast, the foot of the latter having a notch cut in it to fit the bolt ; when the mast has obtained an upright position, a second bolt must be pushed through the box, at the top edge in order to keep the mast in its place.

The mast should be "raked" about 11 inches out of the vertical at the top. It must be 13 feet over all, of $2\frac{1}{2}$ inches by $2\frac{1}{2}$ inches yellow pine, the wood must of course be perfectly "clean." The first 2 feet 6 inches should be left square, the rest rounded and tapered to 1 inch diameter at the head ; it is rounded entirely by the plane, first getting eight flat faces, then 16 faces, the corners of these being taken off with a smoothing plane, and glass papered, the spar will be (or ought to be) round and straight. This process must be carried on with the other spars. The boom will be 12 feet 6 inches by 2 inches by 2 inches ; and the gaff 8 feet by $1\frac{1}{2}$ inch by $1\frac{1}{2}$ inch, that is if the handy "balanced lug" sail be used. Fig. 23 shows the shape and dimensions of the sail. The spots marked with a short cross line show where the mast comes on the gaff and boom. Cut a small slot through the mast, about 10 inches from the head, and let in a pulley wheel, which will take $\frac{1}{2}$ inch rope.

All the rigging should be made from $\frac{3}{8}$ inch diameter *Manilla* rope, except the sheet, which can be lighter. Take about 20 feet of this rope, splice one end into the ring of an iron traveller, which moves up and down the mast, the other end pass through the pulley at the mast head and bring it down into the boat. On the opposite side of the traveller to that on which the ring is, there is a hook, this must be hooked into a strop or rope ring fastened about 2 feet 4 inches from the fore end of the gaff, therefore, when the rope is pulled the sail will go up the mast, being kept to it by the iron traveller.

So much for the halliards, now let us turn our attention to the "tack." The function of the "tack" is to keep the sail down, flat and taut ; at a point 1 foot 6 inches from the fore end of the boom attach a single block, having hooks at top and bottom, the top one is hooked into a strop on the boom, and one end of the tack is fastened to the bottom one. The other end of the rope must then be passed under one of the pulleys of a double block, fastened to the grating frame just in front of the mast, then up and through the single block on the boom, then through the other pulley of the double one, and is then made fast to a belaying pin, two of which are placed at points 1 and 2 in Fig. 20 ; point 3, in Fig. 20 indicates the place of the *double* block referred to above. With this arrangement the tack can be led right aft, and the whole thing handled by one man if necessary. For the sheet, two single blocks are used ; one being placed on the boom just above the transom board, the other on the gunwale. The sheet is now bent on to an iron ring, screwed into the opposite gunwale to the block, and passed first through the block on the boom, and then through

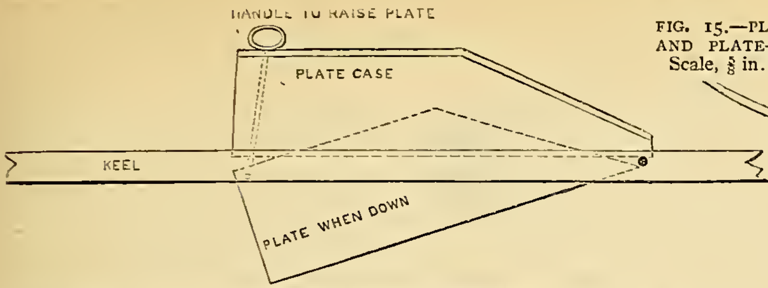
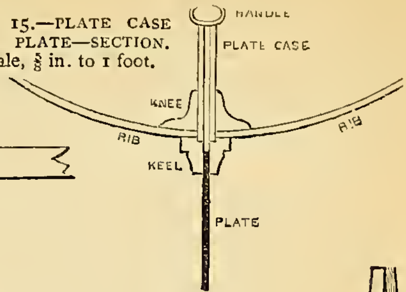


FIG. 14.—PLATE CASE AND PLATE—ELEVATION. Scale, ⅜ in. to 1 ft.

FIG. 15.—PLATE CASE AND PLATE—SECTION. Scale, ⅜ in. to 1 foot.



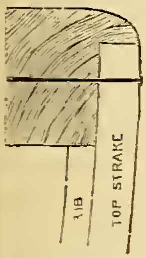


FIG. 17.—SECTION OF GUNWALE.

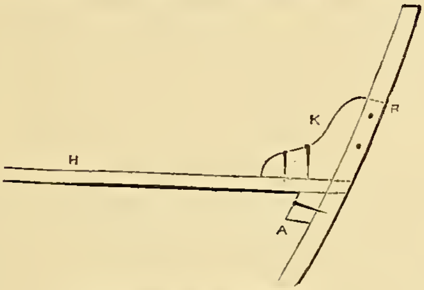


FIG. 21.—KNEE FOR STERN THWART.

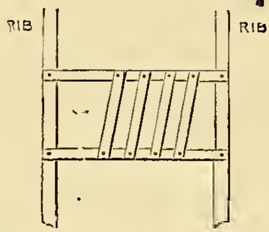


FIG. 22.—FORM OF STRETCHERS.

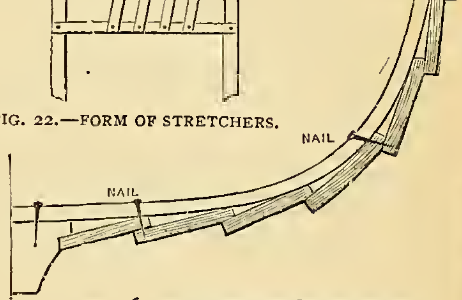


FIG. 16.—HALF RIB, SHOWING MODE OF FASTENING.

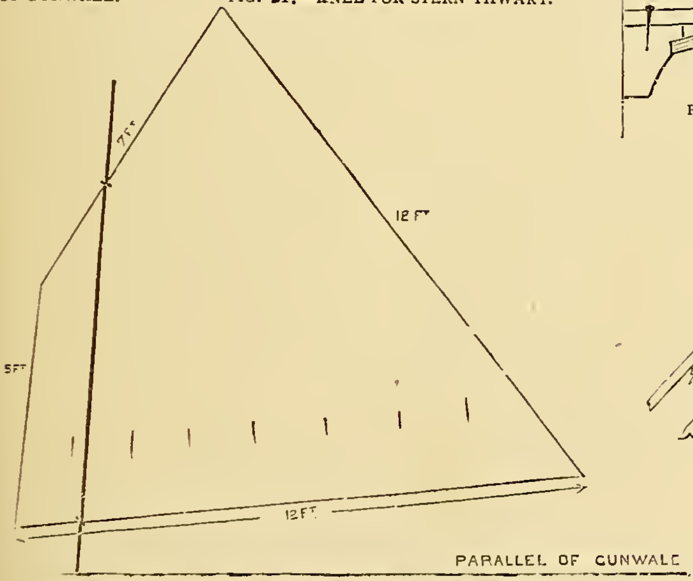


FIG. 23.—SHAPE OF SAIL; SHOWING DIMENSIONS. Scale, ¼ inch to 1 foot.

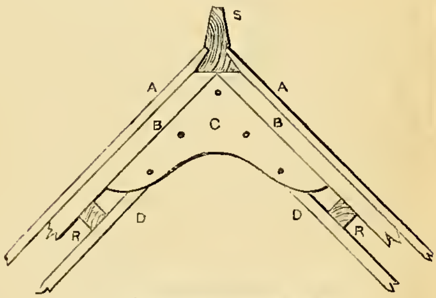


FIG. 18.—BREAST-HOOK IN BOWS.

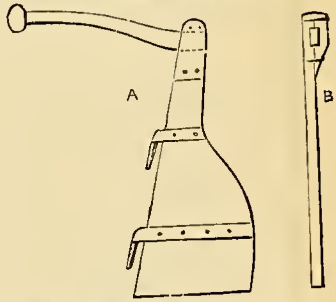


FIG. 24.—RUDDER AND TILLER.

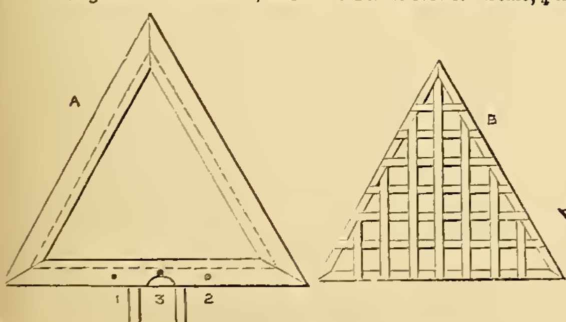


FIG. 20.—FLOORING FOR BOW AND STERN.

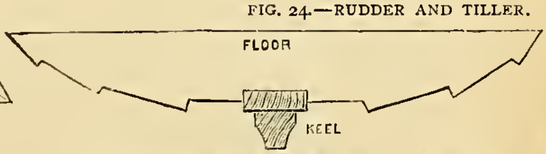


FIG. 19.—FLOORS FOR SUPPORT OF FLOOR BOARDS.

the one on the gunwale, and so into the steerman's hand. The free ends of all these ropes must be lashed, with what is known as an "endless" lashing. Splicing must be learnt, and the half-hitch, reef-knot, bowline, sheetbend, etc., will be found to be most useful knots.

I do not think it is within the amateur's power to manufacture the sail, although some may be found who are capable of doing so. It should be made of white duck, the dimensions along the gaff and boom, which are given to the sail maker, must be about 9 inches *shorter* than necessary to allow for stretching. Two hundredweight of ballast placed well forward will, with two persons on board, give a 9 inch displacement. The ballast had better be of shingle, as shot is so expensive.

The oars must be about 11 feet long over all, the blades 4½ inch at the ends; they can be bought for about 10s. If the amateur means to make them, which will be a troublesome job, and not a very saving one, let him get 11 feet of 2¾ inch pine 9 inches wide; if "scoop" blades are desired he must possess "round soled" planes. For all round work in such a boat as I have described planes with "flat" blades will be best.

The rudder should be somewhat the shape shown in Fig. 24. If intended for river sailing, the length along the bottom must be about 14 inches; if for sea work, about 11 inches. The rudder hinges must of course be bought. The best material to make the rudder from is ¾ or 1 inch elm, a piece of the same being screwed on at the top, to give sufficient thickness to allow the mortise for the tiller to be cut; B, in Fig. 24, shows this. The tiller had better be of oak, and slightly curved upwards as shown, to clear the locker when the helm is "hard over." A galvanized iron or brass shoeing must be screwed on, from the stem-post head, to about 6 inches round the fore foot; a strip of brass along the transom top, greatly adds to its appearance also.

Before the boat is quite finished *every* portion, except the floor boards which are painted and the gratings which are left untouched, must receive three coats of copal varnish, if the expense be no objection, but the two will do. With regard to all fittings such as an anchor, boat-hook, baler, etc., the amateur must, of course, please himself. I think this about finishes off all I have to say about this boat; but as I dare say some will light on points in my papers that are not expressed with sufficient clearness, I shall, of course, be only too happy to answer any questions which may smooth the way. My experience enables me to recommend Boat-building as a pleasant and profitable employment for amateurs.

(*Concluded.*)

VELVET WALL BRACKET.

By G. GIBBONS.

NO one can fail to notice, while traversing the streets of our cities, the number of wall brackets that are exhibited in our shop windows, but I want to confine the reader's attention to those which are covered with velvet, plush, or some similar material. As they are very easy to make, and are exceedingly pretty when hung up with a flower or an ornament of some sort or other placed on them, I am sure many a one would make them if they only had a few hints to commence with. In the hope that my experience in making them may be of service, I now put it before the readers of AMATEUR WORK.

There are, of course, a considerable number of different kinds and shapes, but as they are all made very much in the same manner, a description of one is all that is necessary. I shall therefore describe in full, that one shown in Fig. 1, which exhibits the front view of the article. I made this double the size of the drawing, and it may perhaps cause some surprise when I mention that this bracket covered in velvet and fitted with plate glass, only cost me one shilling and sixpence; which large total was composed of 1s. 1½d. for velvet (about 6½ inches by 17 inches) and 4½d. for glass (5½ inches by 4 inches). The wood I had beside me, but that, being pine, would be a mere trifle. The velvet was not of the very best quality, but it was quite good enough for the purpose, and the glass was taken out of a cheap mirror and answers the purpose admirably. I also made one in plush, which cost me 11½d., the plush costing 9d. and the mirror (sheet glass silvered) 2½d.; but I would not advise anyone to practise such keen economy as that, for the result was not satisfactory, the glass in the latter instance being too cheap to be good. The other glass, the regular price of which is 6d., but which at many shops in large towns may be had at wholesale price—4½d., is as good as need be wished for, unless a bevelled edge is desired. Messrs. Harger Brothers, of *Yorkshire*, keep a stock of small bevelled edge silvered plates, at very reasonable prices. An oval one, measuring 6 in. by 4 in.—the size which is nearest for the bracket which I have been describing—costs 1s. 3d. Square and circle plates are about the same in price for the same size.

I have already mentioned that I made the bracket twice the size of the drawings, but of course this may vary according to the taste of the maker. Three times (that would be from point to point 16½ inches) would make a neat bracket and be of a more serviceable size than those I made, for they were rather small for ordinary use; but, for convenience' sake, I shall describe them as I made them.

Before commencing with the woodwork I got my glass, and as I could not cut it in any way, I made the woodwork to suit it. The glass was square cornered, for oval glass is not got so readily as square, and my plan was to make a rabbet for the glass, as indicated by the dotted line on Fig. 1. I next got the board for the back $\frac{5}{16}$ inch thick, and got the shaping drawn out on it, and also the shelf and little bracket underneath, drawn out on their respective pieces, each $\frac{1}{4}$ inch thick. Fig. 2 is a side view of bracket, and Fig. 3 is a plan or top view of the shelf. After I got these cut out with fret-saw and chisel, they had to be dressed up quite smooth in order to get a level surface, and then "toothed," that is, roughened in order to give the velvet a better catch of the wood. This "toothing" is done by a plane—called a "toothing plane" on that account—the iron of which is almost perpendicular, and catches and looses the wood alternately as it is being used. But if a "toothing plane" is not at hand, a much simpler method of "toothing" is to draw a saw carelessly across the face of the wood in several different directions and at different places, not deep, but just sufficient to roughen the surface.

Get the velvet next, and to calculate the quantity required, take the extreme length of the backboard, allowing sufficient to go over the edges, add the width of the shelf, allowing for covering the front edge, and say $\frac{1}{4}$ inch more, which is to form a little valance or fringe on the shelf edge ; then, as the pieces of velvet for each side of the little bracket may very nearly be taken out of the cuttings left, add, say, half the length of that little bracket to those other sizes, which will make the cuttings quite big enough, and you will have the length your velvet must be—namely, 17 inches. The width will be whatever is necessary to go across the back, over each edge and about $\frac{1}{4}$ inch in behind—namely, $6\frac{1}{2}$ inches. The shelf and bracket must now be fitted together with sprigs, temporarily put in where they will finally be driven home after the whole of the velvet is put on (see dotted lines in Fig. 2). Take the bracket to pieces and extract the nails, after which the velvet must be cut ready for pasting to the wood. This requires to be carefully done, leaving a margin all round of about $\frac{9}{16}$ inch more than is necessary to cover the face of the wood, which margin I need hardly say, is to allow for going over the edge and in behind. It is best to stick this part on at once, for whilst it is drying, the velvet for the shelf and little bracket can be cut out. Paste is too long in drying, and glue far too quick, for our purpose, so I made a combination of them. While the paste is warm I put in about half as much glue as there is paste, and this makes the velvet stick well, and gives me plenty of time to see that it is properly laid on, and in its correct position.

Now, a word of caution will not be out of place here. Keep your fingers clean or you will ruin your work by soiling the velvet, and also lay a clean sheet of paper on your bench, for if the least suspicion of glue or paste gets on the front of the velvet you will never be able to clean it off. To proceed, lay the velvet face down on the bench, and spread the glue-paste well over the wood, and do not spare the mucilage. Take the wood and lay it down on the velvet, taking care that an equal margin is left all round. Put a book or some other light weight on the top, and leave it till it gets a good hold, which will take about an hour. Get the velvet for the shelf cut, leaving a margin on front and both ends, of half an inch. That gives $\frac{1}{4}$ of an inch more than is necessary to cover the shelf-edge, and this forms, when cut, as will afterwards be described, a very fair representation of a fringe, while it makes it unnecessary to cover the underside of the shelf, as is usually the case in those brackets, unless, indeed, the bracket is to occupy a position on the wall where the underside of the shelf will frequently be seen. In that case it *will* be necessary to cover the underside as well. The little bracket supporting the shelf must of course be covered on both sides, cut the velvet for one side to allow for folding over the front edge, and for the other cut it the size of the side of the bracket exactly. Paste the shelf and one side of the bracket, and lay them down on their respective pieces of velvet, taking care that the latter is put down on its largest piece. Then take the first piece you pasted, that is the back, and cut with a pair of sharp-pointed scissors, the edges of the velvet from the outside in to the wood, as shown in Fig. 4. Paste the edges, and just as much of the back as is required to receive the velvet, press it carefully round the edge on to the *back* of the back, giving plenty of paste at the very edge, to keep it secure. This of course must be done all the way round, and round the oval as well, being careful to leave as little wood seen at the curves and corners as possible. A few spaces will be unavoidably left, but these can afterwards be filled in with little pieces of velvet, cut to the size and shape, pasted, and placed in position and gently pressed down. The shelf may now be treated in the same manner, the velvet cut with the scissors as in Fig. 5 and pasted down, only it must not be turned in to the under edge, but hang down loose.

The little bracket should now be taken up, and the projecting velvet cut with the scissors as in Fig. 6, so that it will cover the edge of the wood and go no further. The edge should be pasted and the velvet pressed over. Then when that is dry the other side of the bracket may be covered with the remaining piece of velvet.

When this is dry the shelf and little bracket may

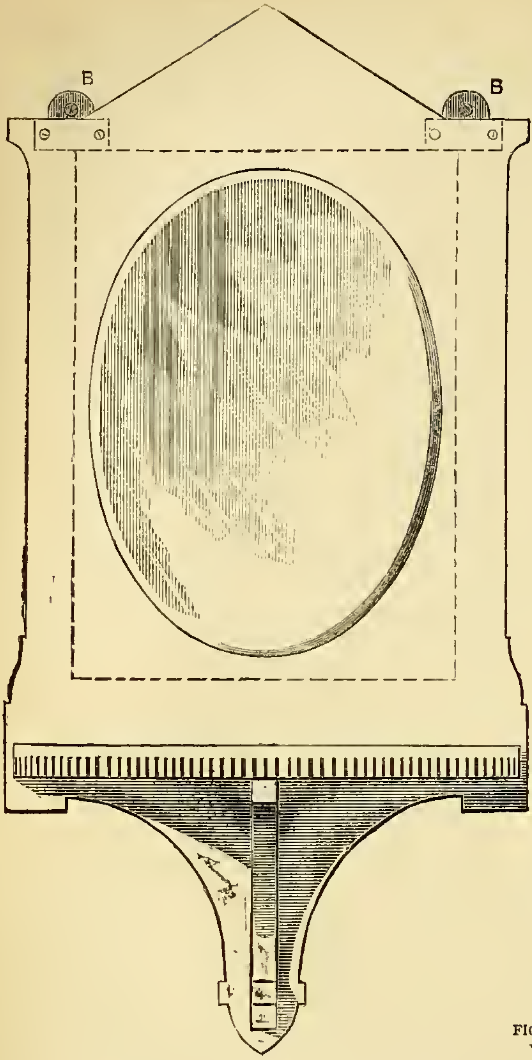


FIG. 1.—FRONT ELEVATION OF VELVET WALL BRACKET.

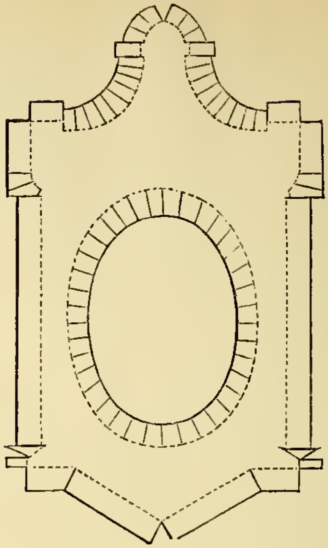


FIG. 4.—MODE OF CUTTING VELVET TO COVER FRONT.

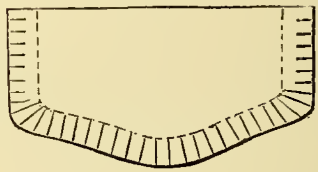


FIG. 5.—MODE OF CUTTING VELVET FOR SHELF.

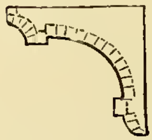


FIG. 6.—MODE OF CUTTING VELVET FOR BRACKET BELOW SHELF.

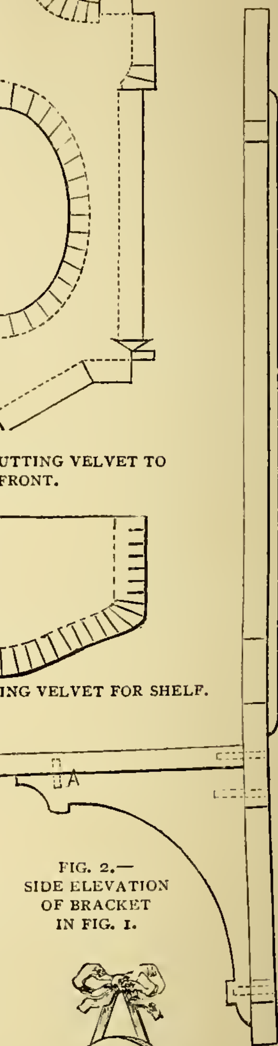


FIG. 2.—SIDE ELEVATION OF BRACKET IN FIG. 1.

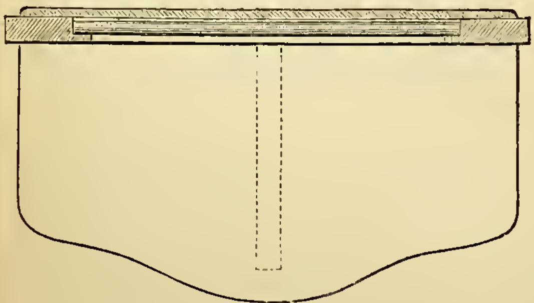


FIG. 3.—PLAN OF SHELF FOR BRACKET IN FIG. 1.

FIG. 7.—SIMPLE FORM OF WALL BRACKET.

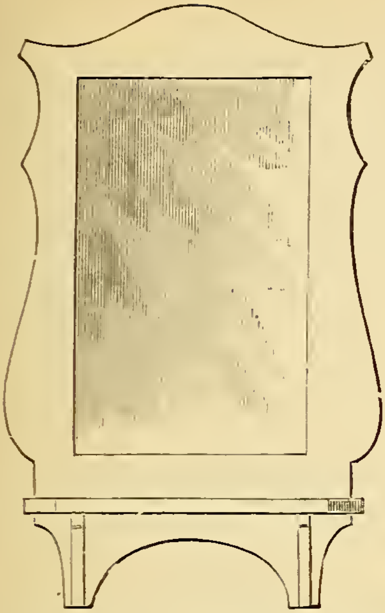


FIG. 8.—BRACKET WITH SQUARE GLASS, ETC.

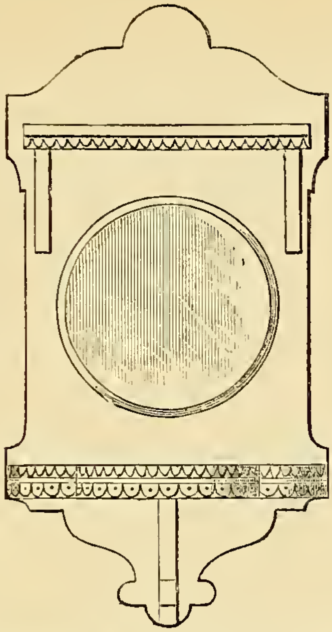


FIG. 10.—BRACKET WITH CIRCULAR GLASS, ETC.

FIG. 12.—SIDE ELEVATION OF BRACKET WITH CIRCULAR GLASS SHOWN IN FIG. 10.

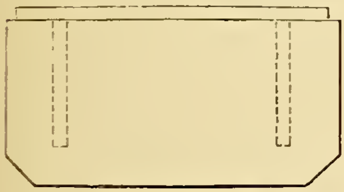


FIG. 9.—PLAN OF SHELF FOR BRACKET IN FIG. 8.

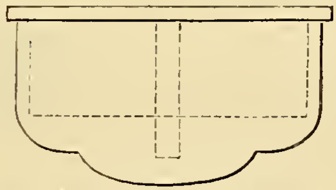


FIG. 11.—PLAN OF SHELF FOR BRACKET IN FIG. 10.

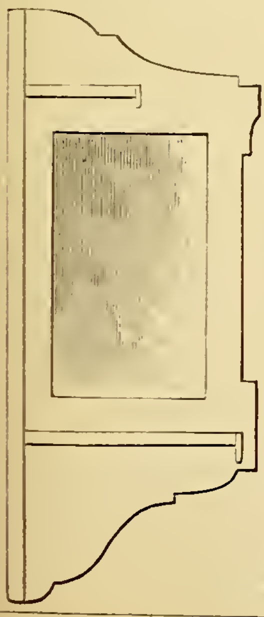


FIG. 14.—SIDE VIEW OF CORNER BRACKET IN FIG. 13.

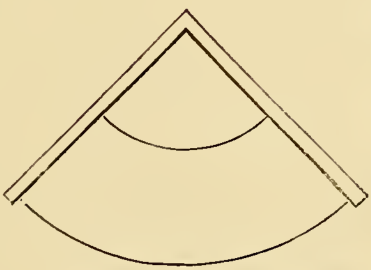


FIG. 15.—PLAN OF SHELVES IN CORNER BRACKET.

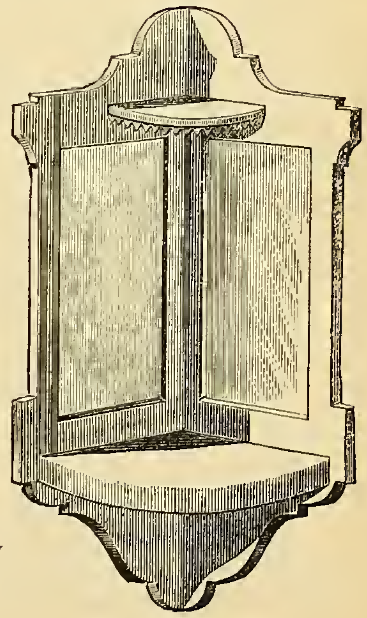


FIG. 13.—PERSPECTIVE VIEW OF CORNER BRACKET WITH TWO SHELVES.

be fixed on to the back with large sprigs, all put in from behind. The pin marked A (see Fig. 2) must be a pin, because a sprig could not be used without being seen either on the top of the shelf or on the underside of the bracket. The glass may now be put in, but it requires something to keep it in. I cut a piece of cardboard $\frac{3}{8}$ inch bigger than the glass all round, this $\frac{3}{8}$ inch being glued (with pure glue) to the wood. This I found quite strong enough, but if a larger one is being made, this might as well be wood $\frac{1}{8}$ inch thick and screwed on behind.

One thing more is necessary to complete the job, and that is means for hanging it to the wall. There are brass wall-plates sold for the purpose, and I have shown them affixed (see B, B in Fig. 1). They are screwed on to the bracket from behind, and are provided with an eye for a nail to go into the wall. But a much more simple method, and one that looks both better and more ornamental, is to fasten on the back with carpet tacks or some similar contrivance, a piece of ribbon, and tie it in the form of a bow about two inches up from the bracket, and hang it by this to a nail in the wall, much in the same way that a picture is hung. The ribbon should if possible be the same shade as the velvet or very near it, though rather lighter in tone than darker.

I have shown a few more varieties of wall-brackets, but it is only necessary to point out the different features in each. First of all, Fig. 7 shows the simplest of all brackets, being only a back and a shelf, with no glass at all, and the shelf merely supported by the nails from behind, and this makes a very neat little bracket, but does not do to be made larger, say larger than 8 inches high altogether. I have shown in this sketch the ribbon hanging method I have already mentioned. Fig. 8 shows a bracket with a square glass, and two little brackets supporting the shelf, a plan of which is given immediately underneath ; Fig. 10 shows one with a circular glass which may be formed in the same way that the oval one was, viz., by a square rabbet being left for it. It has a shelf above, supported on two brackets and a shelf below, with one bracket. Plans of the shelves for brackets in Figs. 8 and 10 are given underneath them in Figs. 9 and 11, the dotted line showing the upper shelf ; Fig. 12 is the end view of the bracket, with circular glass ; and please notice that the top shelf is narrower than the under one, otherwise the general effect would be very heavy. Fig. 13 is a perspective sketch of a corner bracket, which I think is rather a novel-looking article, with its two mirrors and quarter circle shelves. Fig. 14 is a side view of this bracket drawn to scale ; and Fig. 15 is a plan of the shelves, by which I am sure it will be quite easily understood.

The colour of material must be left to the owner's taste ; but I may mention that I have found ruby and old gold do nicely. Olive green also does very well, but not quite so well as ruby.

In some of the sketches I have shown a fringe on the front edge of the shelves. This can of course be managed with the velvet, but if it can be afforded, a nice fringe—nice in design and appropriate in colour—would set out the article beautifully, but take care the fringe is not too deep for the size of the bracket.

There can be great variety in design in these brackets, but I think I have given sufficient to show in what direction they can be most appropriately modelled. As they are so very easy to make, I am sure that all who try them will agree that they are well worth the time and money spent on their production.

HANDY WOOD-WORKING TOOLS, AND HOW TO MAKE THEM.

By A. J. SCOTT.

II.—ROUTER, OR OLD WOMAN'S TOOTH—STOP PLANE —SKELETON GAUGE—SMALLER ROUTER—RABBET PLANE.

MY readers will perhaps remember that in my first article I described some favourite iron planes suitable for all kinds of wood working, from pattern making to cabinet making, which any amateur attempting to make will never, I am sure, regret the time and labour bestowed upon them. In this paper you will see I have a variety of styles, hoping thereby that I can satisfy each amateur's individual taste and wants. It includes two different kinds of routers, one stop plane, and one rabbet plane, the last-named of metal. It also includes a description of a handy skeleton gauge. The first iron rabbet plane which the writer remembers using was in the cogging of a mortise-wheel, the teeth of which have to be carefully fitted into the mortises. I had worked a long time with the ordinary rabbet, but on trying the iron one the difference was wonderful, as the ordinary one required a great deal more hard work, besides making nothing near so good a job. In the following tools, I hope each amateur will not be satisfied, whichever tool he attempts to make, unless he makes a good job of it. Nothing is gained without perseverance. Always remember the old motto, *Nil desperandum.*

I have no doubt that any amateur with ordinary capabilities will be able to make all the tools I shall describe, if he has, as I say, an ordinary amount of perseverance. But now to work. In Fig. 6 we have what is generally termed a Router, or Old Woman's Tooth. Some of the old hands who read these papers

may smile and perhaps call it a clumsy tool, but let those laugh that win. I myself have done, and will do again, I hope, a great of work with such a tool, such as recessing steps for bearings, and all kinds of recessed work. It is also a very handy tool for recessing the work in carving, etc. The diagrams given are in all cases (except Figs. 13, 14, 15) half size; but before setting to work, the amateur should make for himself full-sized working drawings, which he can easily do from the illustrations before him. The best wood perhaps for the router under consideration is beech, of which if you keep to the sizes indicated in the drawing—although there is no absolute necessity to adhere to the dimensions laid down, for these can be altered to suit his own requirements—you will want a piece 6 inches square, and $2\frac{5}{8}$ inches thick, finished size.

The face of the timber will want planing square and true, which, if the amateur has a face plate or surface plate, he can easily accomplish; if not, he must get it out of wind or twist by his winding strips, which are two pieces of baywood about 2 ft. long 3 in. broad and $\frac{3}{4}$ inch thick, perfectly parallel. Mr. Thomson, in his paper on the microscope, has described how to make a couple, so that I shall have no need to do it here; I would advise every amateur to make two, as he will find them handy for nearly every job he intends to do or make. After getting the face true, plane it parallel and square the ends; it would be no worse planing the top parallel with the base, and then you could set the wedge hole out truer. After setting it out, mortise it, making as clean a hole as possible, not forgetting to mortise it wider where the iron and wedge slips in as shown at A; A, on the drawing. Next set the elevation out on either side square with one another as at Fig. 6, and pare right through; afterwards set out and pare through the other way as at Fig 7. Next pare out the finger pieces as at B, B. These help in a great measure, keeping it steady and firm; you can after round all corners except on the working surfaces, and lastly rub with linseed oil until you get a skin on it.

At Figs. 8, 9, and 10 I have put upon paper three views of a very handy stop plane drawn half size. The wood best suited for the purpose is either boxwood or beech. We shall want a piece, finished size, $3\frac{3}{8}$ inches long, $1\frac{5}{16}$ inches thick, and $1\frac{3}{8}$ inch broad. After having planed it all up square and true, mark a line in the centre on either side. Bring the piece to the edge of another board on which you have scribed a line square with the face of it, and with the compasses set at radius C D, scribe the sides of the plane, and afterwards pare to lines drawn; having done this, set out the mouth piece and mortise it, not forgetting the recess E. You will want it for the screw of the back-iron if you put one in, though I have not shown one because I do not think it is needed in this plane; for the rest, I think the views will explain. You will find it very handy for all kinds of sweeps. In finishing the work of inside circular pieces, you will find it very valuable. Whilst speaking of circular work, Figs. 11 and 12 show a tool which is very handy for gauging round curved work of any description, but which an ordinary gauge will not perform; the best wood is either boxwood or rosewood. The views explain themselves. At Figs. 13 and 14 are two views, quarter size, of a router which in form resembles an ordinary smoothing plane. The advantages claimed for this tool are steadiness, durability, freedom of action, and easy to handle. Its main difference, however, is in the shape of the slot hole, which you see is extended to the front, the provision in ordinary ones for the escape of the chippings being by a hole bored in the front of the iron. This is of course, would be quite enough if the tool produced shavings, but it does nothing of the sort, generally the wood is knocked out in large chippings, and needs some better outlet than a mere slit or hole could provide. Fig. 14 shows a plan of the router, I think very little description of its make is needed, as it chiefly explains itself. As will be seen, the chippings of wood knocked out by the tool will find a ready outlet provided for them, while another great advantage is the same opening allows the workman to see what he is doing, and precisely where to stop. In making, we shall simply want a block twice the size of our drawing in beech, the base planed true first, and afterwards set out as in the other planes, and pared. There are a number of smaller routers in use, but the two I have described I consider the best, as they answer, I believe, all requirements.

The fifth and last thing that I shall take upon myself to describe in this article, will be a pattern for an iron rabbet plane, illustrated in Fig. 15. We will suppose you want the iron 1 in. broad, though you can make it any breadth. Well we shall want a piece of wood four times the size of the drawing of the core print and plane, which will be $8\frac{1}{2}$ inches long by $4\frac{1}{2}$ inches broad, and 1 in. thick, planed true, and squared at the ends. Next, we shall want two pieces same shape as pattern A, same length, but only as you find in the broadest part, $3\frac{3}{5}$ inches wide, cut shape precisely to pattern. These are to be sprigged on the core print. I should make them a full $\frac{1}{8}$ inch in thickness. Next sprig a piece of wood to pattern, same place and section of B, shown on drawing, full width over print and side-pieces. Your pattern must be then sand-papered and varnished. The next thing to make is your core box, and on this the success of your job will depend. The best wood for it will be yellow pine or baywood.

In making the core box, if you intend your iron to be 1 inch wide, which I have described the pattern

for, you will require a piece of wood four times the size of B, which will be 12⅝ inches long by 6½ inches wide. Cut a piece out of it, same shape and size, as shown by the crowfoots in the drawing, which will leave the explain the why and the wherefore of putting it there: it would also be much better if it were put on the planes described in my first paper. If the mouth was just cast peeping through, the metal would be very

FIGS. 6 TO 12 ARE HALF SIZE, OR ON A SCALE OF 6 IN. TO 1 FOOT.

Figs. 13, 14, are Quarter Size.

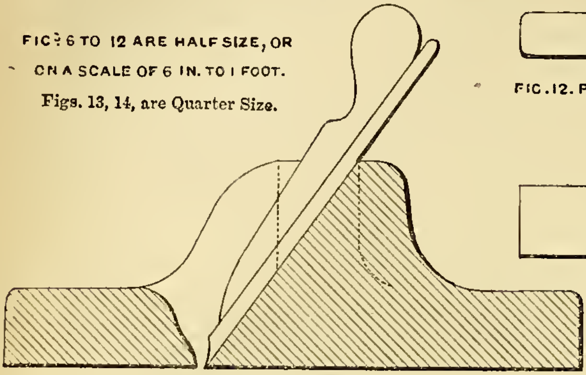


FIG. 6. SECTIONAL ELEVATION OF LARGER ROUTER.

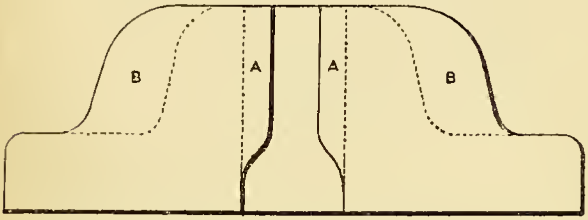


FIG. 7. FRONT ELEVATION OF LARGER ROUTER WITH SECTION THROUGH WEDGE-HOLE OF ROUTER

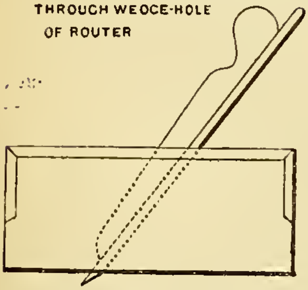


FIG. 13. SIDE ELEVATION OF SMALLER ROUTER

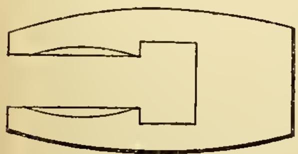


FIG. 14. PLAN OF SMALER ROUTER.

FIG. 12. PLAN OF SKELETON GAUGE.

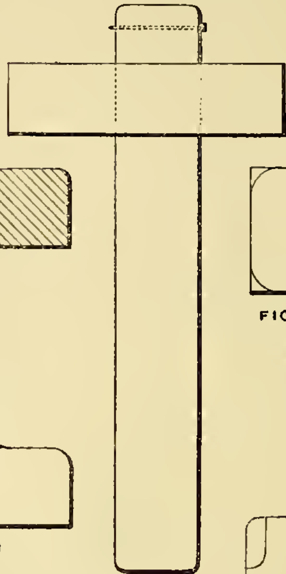


FIG. 11. ELEVATION OF SKELETON GAUGE.

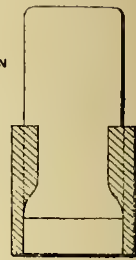


FIG 9. CROSS SECTION OF STOP-PLANE THROUGH LINE A.B. IN FIG. 11.

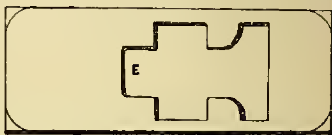


FIG. 8. PLAN OF STOP PLANE

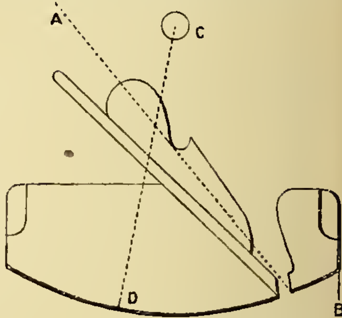


FIG. 10. SECTION THROUGH LENGTH OF STOP-PLANE

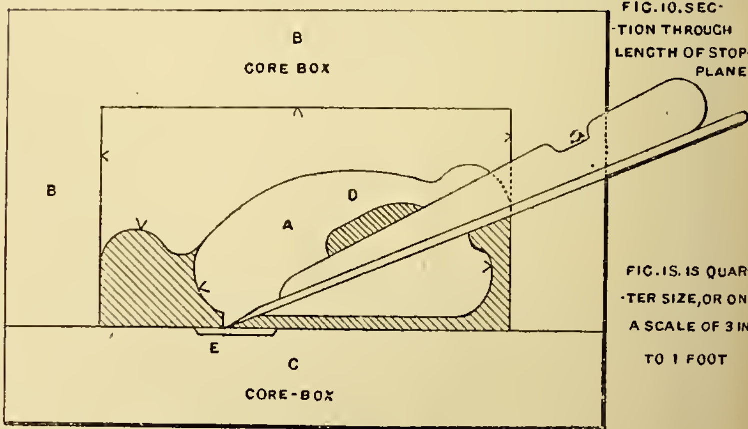


FIG. 15. IS QUARTER SIZE, OR ON A SCALE OF 3 IN. TO 1 FOOT

FIG. 15. SIDE ELEVATION OF RABBET-PLANE.

metal in casting where sectioned on drawing. After cutting it out, fasten a piece to it as shown at C; you can now sprig a bottom to it any thickness so as to fasten the piece D in its proper position.

The piece E cast on the sole of the plane will perhaps puzzle some of my readers, and I will try and brittle, and would soon snap; it is therefore put on to avoid this, as the metal then will be as soft as in the other parts of the plane. I think no amateurs will find much difficulty in making the tools I have described as they do not require very much fitting up.

(*To be continued.*)

A CASKET IN FRETWORK FOR PLAYING CARDS.

By FRANK CROSBIE.

(*For Illustrations see Folding Sheet issued with this Part*).

AN amateur does not spend all his time in the workshop. Most of us have to give the major portion of ours to induce that sweat of brow which enables us to earn our daily bread. There are times when this physiological function has been called into undue activity, we seek some light recreation as rest for mind and body, and we obtain it by joining a few friends in some social amusement. A fair proportion of the amateur world, doubtless, number a game of cards among these social amusements, and some of us have, in all probability, experienced the pleasure of going to find the cards. "Where are those cards? Jane, have you seen the cards? Susan, did you remove a pack of cards from that shelf? Oh, here they are, scattered about in the sideboard drawer—count them—only fifty-one." Fortunately the missing one is also discovered in the drawer, but after diligent search. We must in future have a box for these cards, and not waste half an hour every time we play in finding cards and losing tempers.

I had just completed the piece of work in hand, a fire-screen, and it occurred to me to make a fretwork box for my cards; but at first I intended only to ornament the lid of a purchased box with an appropriate design, to make which I wanted the assistance of an old fashioned pack, having court cards with single heads.

I called at all the stationers' shops I passed for some days, but could not fall in with a single pack that had "legs." None of these tradesmen were able to offer even to procure them. They had not seen any for years, they were not made now, even the little toy packs used by children are double headed. Of course there is a good reason for this, from the card players' point of view. For the act of turning a card round so as to get the head upwards when arranging your hand, gives your adversary an inkling that you hold a court card, and an intelligent opponent, with a little study, would soon be able to form a good idea of the suit it belonged to.

When nearly despairing, I discovered, in conversation with a friend, that he had an old pack, which he was treasuring up as a curiosity, the ace of spades bearing the imprint, George III. All the picture cards are single headed, each card is very thick, with gilt edges, and has the colours laid on by hand, apparently. They were of great use to me. The first thing I noticed was that the character of the ornamentation on these is exactly the same as on the modern ones, and that each picture has a distinct individuality which might be reproduced in fretcutting. In trying to arrange them with this object the only point which beat me was the position of the head. The queens all looked me full in the face. This brazen conduct on the part of the fair sex confounded me. I, a modest bachelor could not overcome this determined stare. Unable to induce the four fair ones to put on a more becoming aside glance, there being no precedent for such departure in the annals of card history, I had to yield, and fled for refuge into the arms of the five of clubs, who proved more tractable and solaced my discomfiture by lending that variety to my design which would have been wanting in a representation of three court cards. This savours of Reynard's soliloquy in the old fable. Yet I am grateful.

With my own sex I fared better and had no difficulty in turning up a king and knave with features in profile as though looking askance at my overthrow. Having accomplished the design, Fig. 3, I intended to place it as an overlay on a box to be purchased. Some difficulty arising as to size I made up my mind to devise a box, to be cut by the fretsaw entirely. The result is before my fellow-amateurs, and I have only to hope that they will find as much amusement in cutting my design as I have had, and that when made the box will be as useful to them as it is to me.

Having commenced by relating experiences, I shall continue in the same strain, and will now describe the various stages of manufacture.

The design is intended to be cut in two woods that will contrast favourably, *e.g.*, rosewood and holly, oak and mahogany, or walnut and sycamore. Ebony and holly give too much the appearance at first sight of a bad imitation of Indian inlaying, and consequently did not suit my taste; but I mention the combination, as others may fancy it.

I used rosewood and holly, and shall keep to these woods for the purpose of description.

The lid, sides, bottom, and feet are to be cut in rosewood; the inlay, backing for sides, and interior divisions in holly. The rosewood, when planed, sandpapered, and polished, is a rich brown, the holly as pure a white as ivory, and the result of their combination being that the figures on the sides of the box show very boldly in silhouette. As a variation these silhouettes may be cut in vulcanite, and fixed on to the sides of a holly box as an overlay.

I used a "New Roger" fretsaw, with very fine saw-blades of the ordinary German pattern. Griffiths' I cannot get along with. They cut admirably at first, but presently a time comes when your saw is transformed into a piece of beautifully polished wire, which refuses to have any dealings with the wood, beyond

indulging in a sort of spontaneous combustion, which leaves a charred blur along the line of your work, to mark the event, and mar the effect.

Good German saws, such as may be had from Messrs. Chas. Churchill and Co., 21, *Cross Street, Finsbury*, are without a match. Next to these, and for somewhat coarser work (ordinary fretwork) the Hibernia does well. But in the hands of a tyro, who is apt to push his wood against the saw, instead of only feeding it, so to speak, giving it no more than it can cut in one stroke, and sacrificing for the sake of time what is of far greater value, finish, these also go wrong, as rough handling wears the points off the teeth. Carefully used, they persistently refuse to break or blunt, and give you clean work with rapid performance. I would recommend the German saws for fine work, and the Hibernia for coarse and thick ; I have cut 1-inch deal with them.

As a saw of good quality is the *sine qua non* of fretwork, this must be my excuse for digressing. I have given my experience, and leave the reader to endorse the opinion, or otherwise.

All the wood is $\frac{1}{8}$ inch, except the pieces used for the feet (Fig. 8) and the centre support (Fig. 9), which require the strength that $\frac{1}{4}$ inch gives them.

I commenced with the lid, and having a handsome piece of rosewood, only cut a pip at each corner, and an opening for the card inlay in the centre, trusting to the grain and French polish to give a satisfactory effect. The lid, as I made it, you will see in Fig. 1, which gives a perspective sketch of the box when completed. In case a more elaborate design be wished for, I offer the alternative pattern, Fig. 3, which carries a cribbage-board in addition.

Next I took a piece of holly, somewhat larger than the exact size of the three cards, and fixed it to the under surface of the rosewood with small screws driven into the waste portions of the wood. When put together, the upper surface of holly should be in apposition to the under surface of rosewood. I then marked the exact outline of the cards on the centre of my rosewood, and drilled a very fine hole, with slightly outward inclination, at one of the angles. The tilting-table of the fretsaw has now to be fixed at a slight inclination, and the marked portion cut out with a series of clean, straight lines. The rosewood shape, which is not required, will come away easily, leaving the holly in view, this being a little too large to pass the opening in the rosewood. Remove the waste pieces of holly through which the screws were driven at the commencement, then touch the edges of the two woods with a little thin glue, lay the holly on a table, place the rosewood in position over it, and with a few taps from a light mallet get it securely fixed. Carefully worked, the two pieces will meet to form clean lines, leaving a drillhole at one corner, which can be filled up with putty, or a small rosewood peg. Place this lid under pressure to dry, and then remove any superficial unevenness with plane and sandpaper, which must also be used to get the surface in as perfect order as possible. Now take the paper pattern, Fig. 3, and gum it in its place. When this has had time to dry, under pressure, if you have a circular saw, cut the marginal lines, else use a broad fretsaw blade, and true up with a plane.

The bottom of the box, Fig. 2, requires no description. I cut it in $\frac{1}{8}$ inch rosewood, with my tilting-table at its greatest possible incline, so as to get a good bevel on the edge. Care must be taken to see that the holes (Fig. 2, A, B, C, D, E) for the tongues are in the right place, as on their arrangement will depend the squareness of the box, and the existence of right angles. For these holes the tilting-table should be returned to the horizontal, where it may remain during the rest of our operations.

Figs. 4, 5, 6, 7 have each to be cut twice, therefore having made the various pieces, eight in all, according to dimensions in the Folding Sheet, and with an eye to angles, again proceed, as in the case of the lid, to fasten together each pair of sides. By this means, with the labour of cutting four, you will get all eight pieces done accurately.

Note that the sides of the box are to be cut with the tongues attached to the lower edge of each, and will require careful fretsawing, instead of circular saw and plane, which will be handy for the other pieces.

While on the subject of notes, let me advise the cutting of the lid and sides from one piece of rosewood, by this means you get a continuity of grain from side to lid.

The operation of putting the sides together comes next, and this was done by means of simple dovetails, Figs. 11, 12, which the fretsaw will make, and glue fasten. This, when accomplished, is ready for the lid, which is to be secured with glue and needle points. Treat the sides and bottom similarly, and you are ready to take the holly backing in hand. Four pieces of $\frac{1}{8}$ inch holly—two $8\frac{1}{2}$ inches by $1\frac{7}{8}$ inch, and the other two $6\frac{3}{8}$ inches by $1\frac{7}{8}$ inch—must now be cut with the usual regard to squareness, and the ends must be mitred so that they may slide into the box, and fit closely up to its sides, projecting $\frac{1}{4}$ in. above them, and forming a collar for the lid to fit on (Fig. 13). This backing will be found a great support to the box, and will also throw up the design. It should be fastened into the box with a few touches of glue along the edges. The box must now be secured to its base, by passing the tongues through the holes made for them, and fastened by needle points run through at right angles to their long axis.

The box may be lined with coloured paper, or, better still, with satin or silk. For this latter plan, you will require five pieces of cartridge paper cut to the inside measurement of sides and bottom. Then cut your silk about $\frac{1}{2}$ inch larger. Put it face downwards on the table, lay your paper on it, and glue the protruding margins of silk to it. When dry give the back of the paper a coat of glue, and fix it evenly in place. This applies to all the lining, except that of the lid, which consists of a piece of holly, about $3\frac{1}{2}$ inches by $6\frac{1}{2}$ inches, covered on one side with silk, and having a piece of rosewood the shape of the three cards let into its centre, similarly to the way in which the cards are inlaid on the lid.

Now touch the under surface of the lid here and there with glue, and when this is tacky put the holly backing against it, and apply pressure for a few minutes, after which line the sides of lid similarly to those of box.

The corner pieces, or feet (Figs. 8 and 9) must each be cut twice in $\frac{1}{4}$ inch rosewood, and the edge chiselled so as to overlap the corners of the box and hide the dovetails. These will require to be fastened with glue, and needle points through the bar which runs under the box. The centre support (Fig. 10) is made of two pieces of $\frac{1}{4}$ inch rosewood, crossed, and then fastened underneath the box. This is very necessary as a relief to the feet, which would else tend to come asunder, under the weight of box and its contents.

Two pieces of $\frac{1}{8}$ inch holly, one to fit across the box each way, must now be cut and crossed similarly to Fig. 10, and being covered with silk, put in place, to make the four compartments.

By laying two pieces of ribbon across the box before pushing home this partition, you will have the means of raising the cards out of their respective compartments when wanted.

By doing without the tongues in Figs. 5 and 7, and making the bottom of the same measurement as the top, the feet may be dispensed with, and a square box resting on its own base would be the result, but the addition that these figures make to the ornamental appearance of the box is very great; in fact, with them there may be fair claim laid to the term "casket." The design can be altered further to make a box holding two, or even one pack. In the former case one could either make an oblong box by shortening the two sides, and cutting away so as to narrow lid and bottom, or two of the compartments, without a partition, could be utilized for holding counters. If for a single pack, the sides being reduced in length by excising some of the silhouettes, the top need only consist of the middle card in Fig. 3, with a narrow border left round it.

In case the little inlaying might be an obstacle, let me advise the alternative of having a perfectly plain lid, on which the card design, cut in brass or nickel silver, could be fastened. With a good polish on the metal the general effect would be very fine, especially if the amateur can enlist the services of an engraver to reproduce the design as shown in the originals.

With all these suggestions for making a piece of work that is useful as well as ornamental, I hope that each amateur who attempts to follow me will be able to do so to his own satisfaction. It is a piece of work by no means as hard as it looks, and the time and trouble will be amply repaid by a good-looking piece of furniture.

In conclusion, I may say that any further assistance which it is in my power to give to my fellow-workers will be willingly rendered through "Amateurs in Council."

A SUBSTITUTE FOR THE ROSE ENGINE.

By R. LEWIS.

IN the rose engine the mandrel passes through and is fixed to rosettes of various patterns, and these acting against a fixed stud causes the head to rock as the mandrel revolves, consequently a point held steadily against the face of the work whilst it is revolving, traces a line similar, or nearly so, to that of the rosette which causes the oscillation. In this arrangement matters are reversed: the tool vibrates and the headstock remains stationary.

The work to be ornamented is fixed to the face-chuck in the usual way with cement or otherwise, but to the back of this chuck is attached a rosette made of metal, and this rosette as it revolves presses against a roller carried by a rocking lever which is formed of a boss fitting on to the rocking bar, and having on one side a straight arm, on which is fixed a weight to keep the roller always in contact with the rosette, and on the other a curved arm having a boss at its upper extremity, which acts as a tool-holder for the shaft carrying the roller, and is fitted with a screw for the purpose of holding and adjusting the roller.

The separate parts will be described in detail. Similar letters represent similar parts in all the drawings. The general plan is to a scale of three inches to the foot, or one quarter size, and the detail half size for a 5-inch centre lathe. Any difference in the height of centre will, of course, necessitate an alteration of dimensions as far as regards height, or, if the amateur has sufficient skill to construct the machine in metal, instead of making it of wood, as, I daresay, many woodworkers will wish to do, other drawings of a

SUBSTITUTE FOR THE ROSE ENGINE.

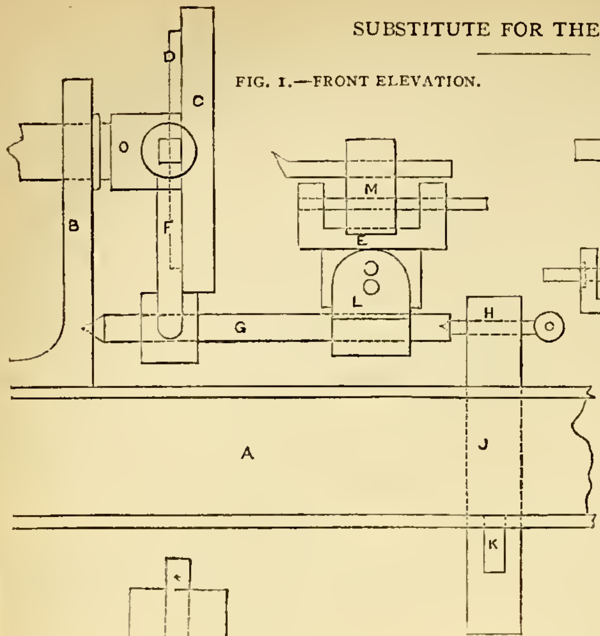


FIG. 1.—FRONT ELEVATION.

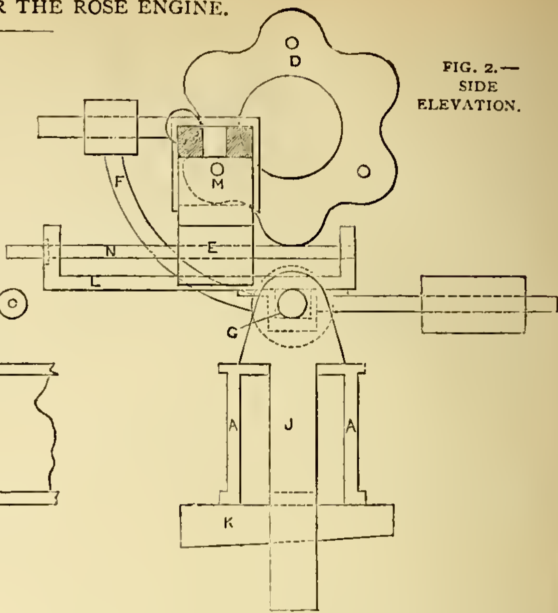


FIG. 2.—SIDE ELEVATION.

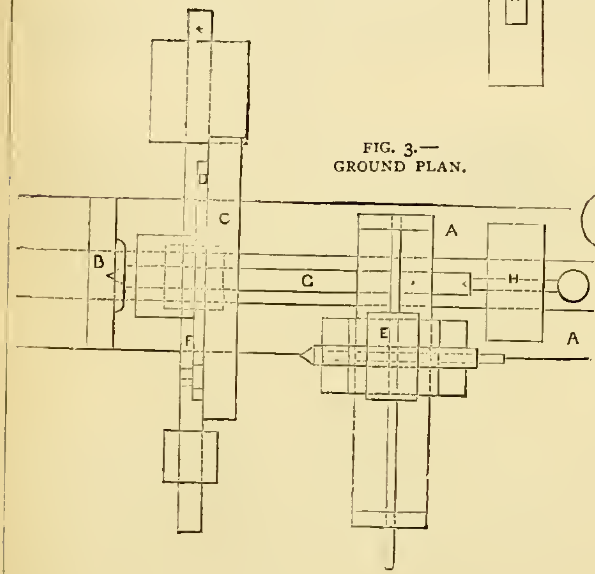


FIG. 3.—GROUND PLAN.

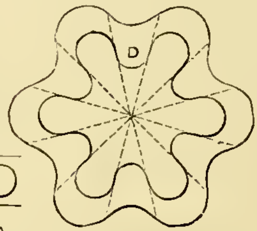


FIG. 6.—DIAGRAM SHOWING HOW THE FIGURE IS ALTERED BY THE TOOL BEING AT DIFFERENT DISTANCES FROM THE CENTRE.

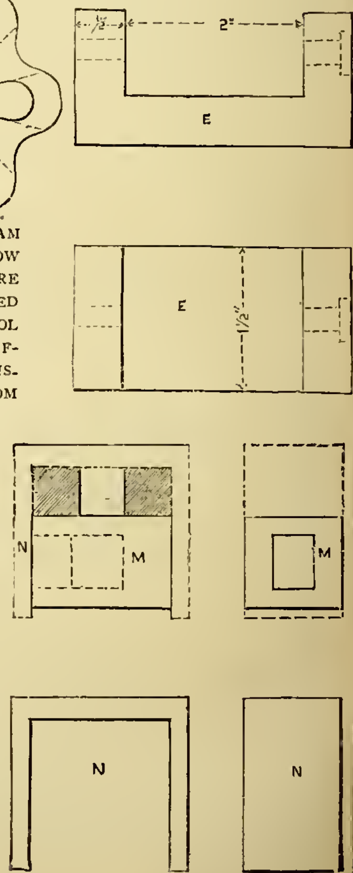
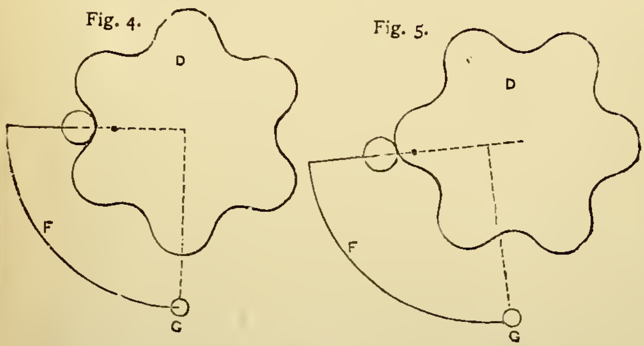


FIG. 7.—DETAILS OF UPPER SLIDE.



FIGS. 4 AND 5.—DIAGRAMS SHOWING DIFFERENT POSITIONS OF ROCKING LEVER IN DIFFERENT POSITIONS OF ROSETTE.

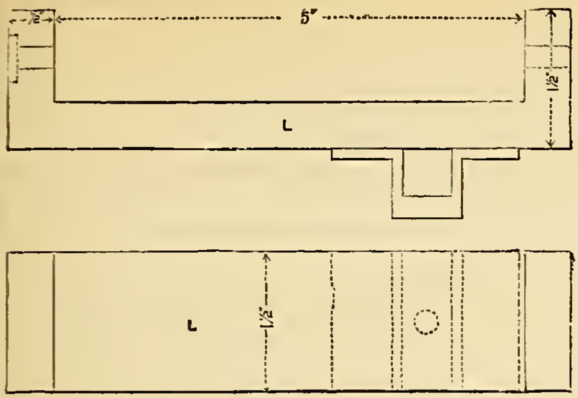


FIG. 8.—DETAILS OF LOWER SLIDE.

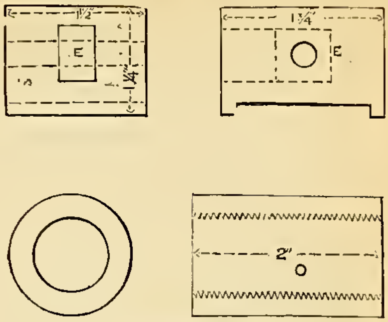
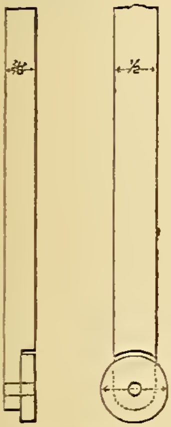


FIG. 9.—LENGTHENING CHUCK.



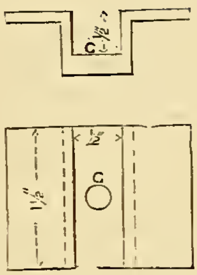


FIG. 10.—DETAIL OF ROLLER AND SHAFT.

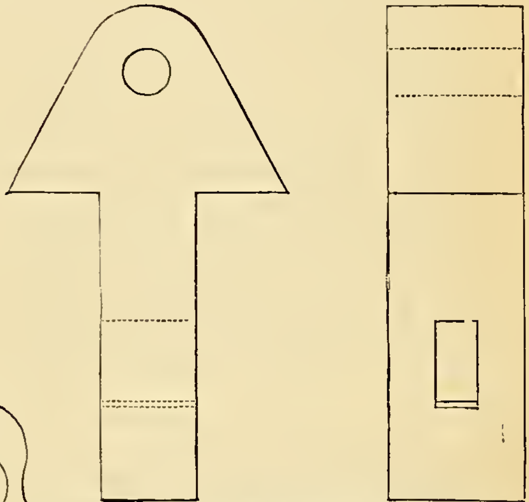


FIG. 12.—DETAIL OF STANDARD FOR BACK CENTRE OF ROCKING BAR.

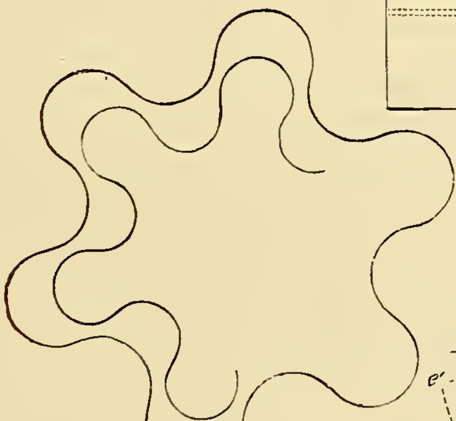


FIG. 13.—ENLARGED VIEW OF FIG. 6.

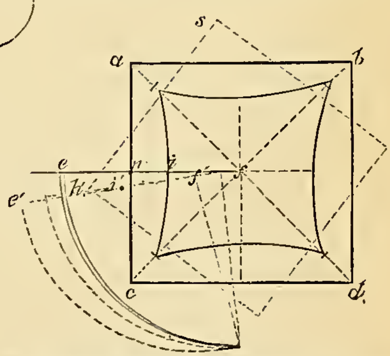
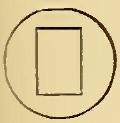
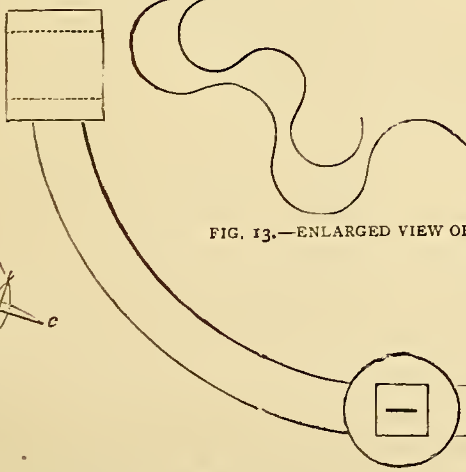


FIG. 14.—DIAGRAM SHOWING HOW TO LAY OFF THE FIGURE THAT WILL BE GENERATED BY ROSETTE.

FIG. 15.—DIAGRAM TO ILLUSTRATE PROBLEM.





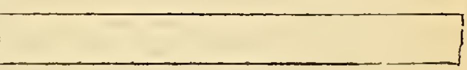


FIG. 11.—DETAIL OF ROCKING LEVER.

lighter and somewhat different design must be made, although the principle will remain the same.

The rocking-bar (G, Figs. 1, 2 and 3) is an iron bar $\frac{1}{2}$ inch square, turned to a point at one end (and will be all the better if it be steeled there) to go into a recess in the headstock, $1\frac{1}{4}$ inch above the bed, and immediately under the centre; the other end has a hole drilled in it, and is supported by the screw carried by the standard, H, which has a tail-piece, J, passing through the bed, and held in its position by the wedge, K. This bar carries a slide, L, set at right angles to it, 5 inches long in the clear, or 6 inches over all, and this slide is fitted with a sliding-block, E, $1\frac{1}{2}$ inches long and $1\frac{3}{4}$ inches wide, having a flange on each side for steadiness. In this block is a recess in which is set the nut of the screw, N, after the fashion employed for bedsteads, etc., supported by the standard at either end. The screw for causing the backward and forward movement of the block should be turned at the shoulder, and also at the end, to allow of it working freely and smoothly in its bearings; the collar at the head should also be turned to fit the recess made for it in the standard of the slide, and be retained in its place by a metal plate. The slide is attached to the bar by the broad band, G, forged the width of the slide, and about $\frac{1}{8}$ inch thick, but thicker at the bottom, so as to give more hold to the tightening screw.

The block, F, carries a slide shorter (2 inches by $\frac{1}{2}$ inch by $\frac{1}{2}$ inch), but in other respects similar to the one supporting itself. A block, 1 inch deep, works on this, a strip of metal leaving a space of $\frac{1}{2}$ inch above, which forms a tool-holder by the insertion of the shaded block, is screwed to this, and the tool is held firmly by a screw passing through the top, which is forged thicker for its reception. The sides project below the bottom, forming flanges and guides.

It will be seen that $1\frac{1}{4}$ inches from top of bed to centre of bar, $\frac{1}{4}$ inch to top of bar, $\frac{1}{2}$ inch thickness of slide, 1 inch depth of bottom block, $\frac{1}{2}$ inch top slide, and 1 inch top block, to the surface of tool-holder, makes $4\frac{1}{2}$ inches, leaving $\frac{1}{2}$ inch for depth of tool to centre of lathe.

Most probably there will not be sufficient room between the back of the chuck and the face of the mandrel head to allow of the rosette and the roller working against it. This difficulty may, however, be easily overcome by making a metal chuck, as shown in Fig. 9, by O, about 2 inches long, thus converting the mandrel into a female, or hollow one. When supplied with a tool of this kind, the amateur can keep a stock of wood screws by him, ready to glue into any piece of wood suitable for a chuck, which will be a considerable saving of time and expense for material where hard wood, such as box, is used. If he cannot cut up the screws in the lathe, he will doubtless be able to obtain a screw-box for cutting up wooden screws of the proper size at the tool-maker's, at a cost of three or four shillings.

The roller should be as small as possible, so that it may be able to get into small indentations in the rosette, otherwise it will not touch the bottom of the pattern, and a correct representation will not be obtained.

The motion must be a slow one; in fact, it had better be caused by hand, as but one revolution is required to describe the figure, unless it is very deep.

The apparatus is only suitable for ornamental surface work, although such pieces as elliptical tool handles may be turned with it, when the ordinary speed may be used.

The figure traced will not be an *exact* fac-simile of the rosette, except when it is the same size, inasmuch as the depressions and elevations will be always the same, whatever may be the distance of the tool from the centre, but as the periphery varies so will the figure be raised or flattened; this will be understood by Fig. 13. Again, a flat-sided rosette will not give a flat-sided figure, but one with scallops, as may be most simply illustrated by a square.

Construct a square, A B C D, as in Fig. 14, out of sheet metal or cardboard, and with a pin through its centre, so that it may freely revolve; attach it to a board. Then take a piece of similar material having one right angle, as at F, and a centre $3\frac{3}{4}$ inches below it, which represents the distance between the centre of the mandrel and the centre of motion of the rocking-bar. Now, let H be the roller, and I the point of the tool where the sides of the square are perpendicular. Of course, there will be a similar mark at a similar distance from the centre, at the middle of each of the four sides, where they revolve; but when either of the corners comes against the roller the arm will be forced into the position (E′, F′, G′), and the roller into that of H′, and the tool into I′, which will be where it touches each corner.

You have now three points in a circle, and by a well-known geometrical problem the centre of the circle can be found, and the curve through the three points struck. The same operation can be repeated with the tool nearer the centre, when it will be found that the lines are not parallel, although the distances apart are the same at the centres, and at each corner. Unless the amateur has time and skill to make rosettes of elaborate designs, he will find that flat-sided polygons will be easy to make and pleasing in effect.

As the problem to which I have referred above may not be known to all, I therefore give it.

Problem. Through any three points to describe the circumference of a circle.—From the middle point

B, Fig. 15, draw two straight lines, B A and B C to the other two points, A and C, divide the straight lines A B and B C into two equal parts by perpendiculars meeting at O, which will be the centre.

In practice we generally leave out the straight lines A B and B C, which are immaterial, as long as all the segments are of the same radius.

PHOTOGRAPHIC APPARATUS:

ITS PREPARATION AND CONSTRUCTION.

By J. POCOCK.

II.—THE CAMERA ITSELF.

HAVING now finished at least one dark slide, we will commence the camera itself. First, we must decide upon the lens to be used with it when finished. A lens of about 5 inches back focus is very suitable, and as the camera has no focussing slide the lens must of course have either a sliding or rack-work adjustment for focussing.

For the back of the camera four pieces of $\frac{1}{4}$ inch wood ($\frac{}{16}$ when planed) will be required, and these must be planed down to the following dimensions: Two pieces, each $\frac{7}{16}$ of an inch in width, and $5\frac{1}{4}$ inches long for the sides, one piece $\frac{1}{4}$ of an inch wide and $4\frac{1}{2}$ inches long for the top, and one piece $\frac{3}{4}$ inch wide and $4\frac{1}{2}$ inches long for the bottom. These pieces are to be mitred or dovetailed at the corners, and glued up. If dovetailed, they should of course be cut a little longer in the first instance, say $\frac{1}{4}$ inch, the dovetails cut down to the right length, and the $\frac{1}{8}$ of an inch which will then be left over at each end may be cut off when the glue is dry. The bottom and sides are to be joined so that they are level at the back, the bottom projecting out $\frac{5}{16}$ of an inch beyond the side-pieces in front. The top, on the other hand, must be put in so that it will be level with the sides in the front and recessed $\frac{1}{4}$ inch at the back, as shown in Figs. 8 and 9. A slip of brass $\frac{5}{16}$ inch wide and $5\frac{1}{4}$ inches long is now to be screwed on to each side of the back with four or five screws, these will form the runners for the dark slides, see A A, Fig. 15.

The front of the camera should be of the shape shown in Fig. 10. It may be cut out of $\frac{1}{4}$ inch wood, and should be $2\frac{3}{4}$ to 3 inches wide, and about $3\frac{1}{4}$ inches high, the centre of the hole for the lens flange being exactly $2\frac{3}{8}$ inches from the bottom.

Now we must decide upon the exact shape for the leather body, and by far the best way to determine this is to make one of brown paper first. The shape required will be something like that shown in Fig. 12, the length will be about 18 inches and the width may be made, in the paper pattern, about $1\frac{1}{2}$ inches more than the back focus of the lens. The lens flange should be screwed into its place, and the paper pattern fastened round the front with a few spots of glue, and when the glue is dry the lens must be screwed into the flange and the paper body brought inside the camera back, care being taken that the projecting piece at the bottom of the back is towards the front of the camera. The paper can then be fastened round the back with pins; a piece of ground glass should now be placed in the dark slide, the shutters on both sides being drawn out, and the slide held in place at the back of the camera, while the front is directed towards some distant view. When the view has been accurately focussed the distance of the lens from its flange must be noted, and the back moved inwards until the view is in focus with the lens pushed in very nearly as far as it will go. The pattern is then to be again pinned to the back and the superfluous paper cut off. The join should of course come at the bottom, the paper overlapping $\frac{1}{2}$ inch.

From the paper pattern thus obtained the body may be easily cut out in leather. The leather used should be thin and supple but strong, and it should be cut $\frac{1}{4}$ of an inch or so longer and wider than the pattern, so that the body may be a little full when it is finished, since this will allow the camera to fold up more easily.

Four strips of walnut wood are now to be cut to go round the front of the camera, as shown in Fig. 11. The bottom piece should be $\frac{3}{8}$ of an inch wide, the other pieces about half that width, and the top piece is brought to the necessary curve by dipping it in boiling water and then holding one side of it towards a gas flame. When it is thoroughly hot—just upon the point of charring—in fact, it may be bent to the required shape as easily as a piece of whalebone. It should then be put in its place on the top of the front, bound down with tape and left for twenty-four hours, when it will be found to retain the shape thus given to it. Four pieces of deal must also be cut, to go inside the back, the pieces for the sides and top should be $\frac{1}{4}$ of an inch square, and that for the bottom $\frac{1}{4}$ of an inch thick and $\frac{1}{2}$ inch wide, the corners should be mitred, and the pieces should fit into the back easily, leaving room for the leather body to be fastened in between them and the back.

The leather body must now be fastened to the front in the following manner: Glue one side of the front, and, looking to see that the end of the leather will come to about the middle of the bottom, press the edge smoothly down, glue one of the side-pieces and put it over the leather and secure with a couple of fine $\frac{3}{8}$ of an inch screws. The tops of the side-pieces and the two ends of the curved piece should be

cut as shown in Fig. 11, and the ends of the curved piece will not then be able to straighten out should it get damp. Proceed in the same way with the top piece, only here it is best to cut two very small nicks in the leather about $\frac{1}{8}$ inch deep and 1 inch apart, just at the top; by bringing together the edges of these nicks a slight lateral fulness will be given to the body, which will enable the front to be more easily pushed down for folding up. The other side and the bottom are then to be glued and screwed in the way already indicated, only that the bottom will need longer screws or the holes may be bored half way through with a large bradawl, so that the heads of the screws will be countersunk to that extent. Four screws should be used for the top and three for the bottom.

The other end of the body is now to be fastened into the back in the same way, the strips of deal being glued and screwed inside, over the leather, in such a manner that they will leave a margin of $\frac{3}{16}$ inch all round at the back. The seam of leather at the bottom is then to be glued up, and the body of the camera is so far finished.

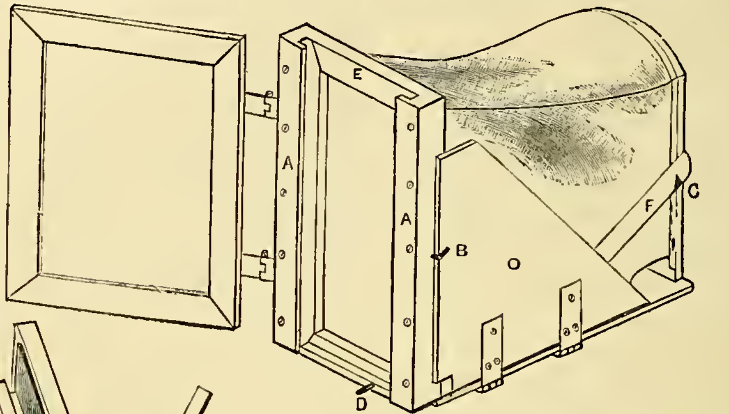


FIG. 15.—CAMERA COMPLETE AND OPEN.

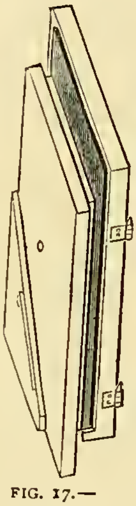


FIG. 17.—CAMERA CLOSED.

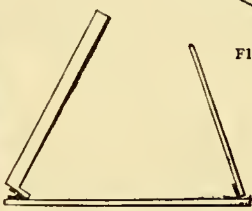


FIG. 18.—SECTION SHOWING METHOD OF ATTACHING FRONT AND BACK TO BASE BOARD.

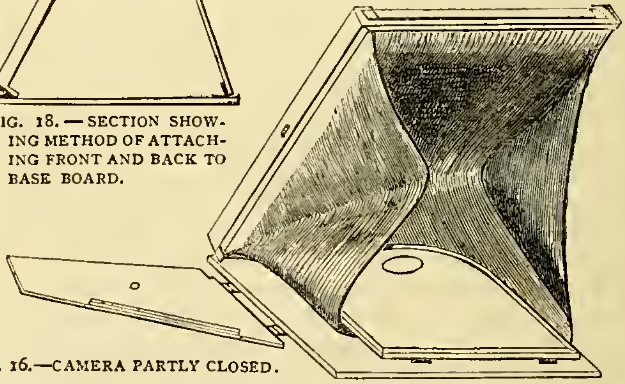


FIG. 16.—CAMERA PARTLY CLOSED.

The baseboard should now be made. It may be constructed of one piece of wood, but is better made of five pieces, tongued and grooved as shown in Fig. 13. It should be made of $\frac{1}{4}$ inch wood planed down, and should be $4\frac{1}{2}$ inches wide, while the length must depend on the length of the body of the camera, and consequently upon the focus of the lens. The side-piece should also be cut out of $\frac{1}{4}$ inch wood. The measurements may be taken from the drawing, Fig. 14, which is half size. The straight side is rebated on the inside to rather more than half the thickness of the wood. The hinges are not to be put on till the camera is put together. D is a piece of thin brass fastened by a screw to the inside of the side-piece; it serves to keep up the front of the camera. The nick in the end should be filed after the camera is put together. The holes in the centres of Figs. 13 and 14 are for the nuts of the camera screws.

The outside dimensions for the focussing screen are 5 by $3\frac{3}{4}$ inches and the width of the frame should be $\frac{1}{2}$ inch. The ground glass may either be fitted into a groove in the frame when the latter is put together, or it may be fixed into a rebate by small brass slips screwed on at the corners of the frame, and the latter plan has this advantage, that the glass may be easily and quickly renewed in case of breakage.

The camera may now be put together. Fig. 18 is a section of the camera partly closed (the leather part being left out for the sake of clearness), to show the way in which the front and back are hinged to the baseboard. Two hinges should be used for the back and two for the front, and it will be seen that the front hinges are screwed to the back of the camera front, and need not be countersunk, while the hinges for the back are screwed on to the under part and the whole hinge should be countersunk into the back and not into the baseboard. The focussing screen is now hinged to the back with the proper hinges made for this purpose, as seen in Fig. 15, and the side-piece, Fig. 14, is to be hinged to the baseboard with similar hinges, the short ends of the hinges being screwed to the underside of the baseboard. This side-piece must be hinged to the baseboard in such a manner that when it is set up the

side of the back will fit into the rebate, and the back be thus held upright and this part of the camera kept perfectly rigid. A piece of bent wire (B, Fig. 15) screwed into the side of the back acts as a catch,

A small piece of brass (D, Fig. 15) should be screwed to the back to keep the focussing screen from falling open, and a piece of velvet may be glued on at E, as a precaution against the entrance of light.

PARTS OF CAMERA.

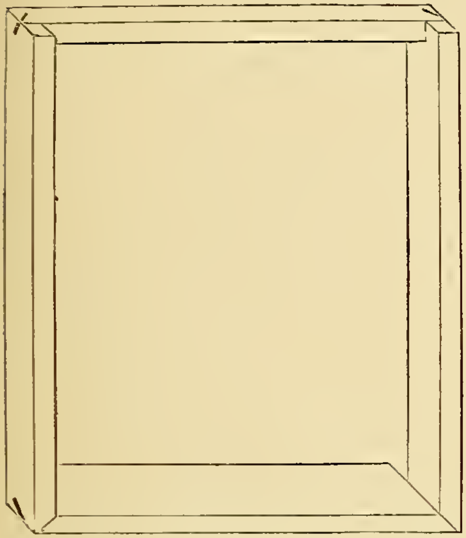


FIG. 8.—BACK.

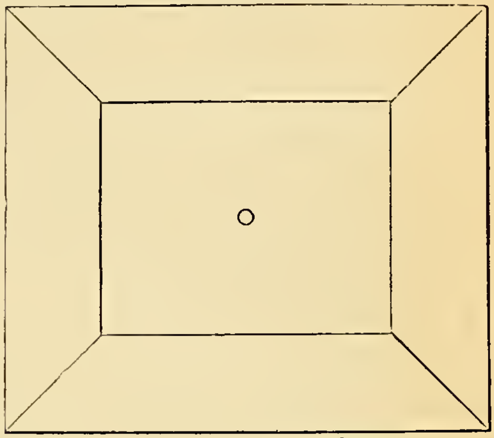


FIG. 13.—BASE BOARD.

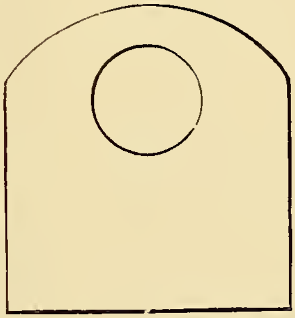


FIG. 10.—FRONT.

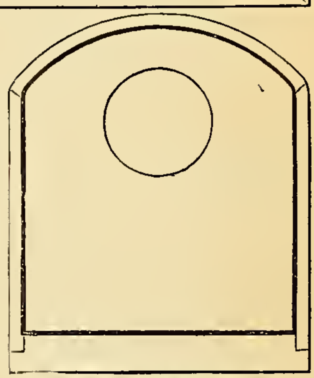


FIG. 11.—FRONT FITTED WITH STRIPS OF WOOD.

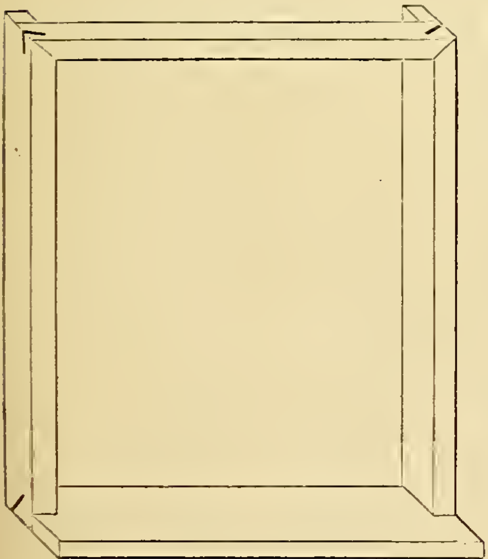


FIG. 9.—FRONT VIEW OF BACK.

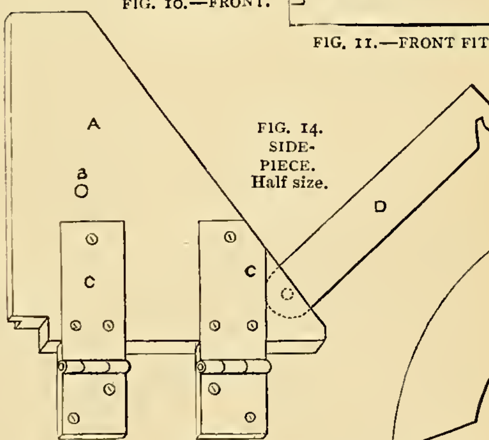


FIG. 14. SIDE-PIECE. Half size.

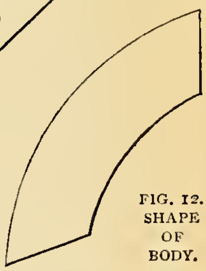


FIG. 12. SHAPE OF BODY.

turning down in order to keep the side-piece in place. A small brass gimp nail is driven into the side of camera front at C, Fig. 15, and a nick filed in the brass stay, as shown in Fig. 14, so that when the camera is set up this nick engages the nail, and the front is kept upright and parallel with the back.

Now the camera has only to be polished or varnished, for which purpose it should be partly taken to pieces again, and it will be finished.

To fold it up, the brass stay (F, Fig. 15) is pushed back behind the side-piece, and the side-piece itself turned under the baseboard, the front is then pushed

down inside the body and the sides folded inwards as the back is pushed down. Fig. 16 shows the camera partly closed, and Fig. 17 shows it quite closed.

This camera can with ease be put up ready for screwing on to the tripod in eight seconds, and folded up after use in five seconds.

Having myself found some difficulty in procuring camera hinges, I may here mention that Messrs. James Lancaster & Son, of *Birmingham*, will supply entire sets of brass work for cameras; particulars of these sets will be found in page 9 of their catalogues.

In the inscriptions appended to the diagrams that accompany Chapter I., that for Fig. 1 should read "Grooving for one side of frame," and for Fig. 2, "Grooving for one side and end of frame."

(*To be continued.*)

HANDY WORK IN FARM AND GARDEN.

By GEORGE EDWINSON.

III.—FENCES (*continued*)—GARD FENCES—WOOD FENCES, ETC.

IN former articles, some information was given on the construction of various farm fences. The fences for gardens and for small enclosures differ but very little from those found best for large enclosures. Since writing my former articles, I have been informed that a few difficulties present themselves to thwart the successful adoption of my plans for farm fences in some parts of the world where the soil is loose and sandy, and the climate is dry. In such parts the construction of turf hedges or dykes would not be advisable, nor would it be advisable to plant stone hedges with bushes, in countries where the soil is sandy and the climate is dry, unless certain plants are found which are indigenous to the country and will thrive on sandy banks. In our own country the whin, gorse, or furze will grow in sandy soils. If a choice of soils can be obtained from which to cut the turf, choose that which has most solid earth and clay, and choose a similar soil for stone hedges when these are to be planted.

In choosing plants for garden hedges, avoid the hungry elder tree for all parts except the rubbish corner, or a similar useless part of the garden; also avoid sycamore, horse-chestnut, and similar leafy, hungry trees that run their roots far under the garden, impoverish the soil, and shut out light and air. It should also be known that plants must not exceed three years in age at the time of planting.

Turf and composite hedges are not suitable for garden fences, since they harbour slugs, snails, and other vermin, and are expensive to keep in repair, on account of the raids made on them by juveniles. Turf banks, of about three feet in height, and planted on top with choice plants, may, however, be admitted as division fences between garden plots, but such banks should be broad in the foundation and of wedge-shaped section. Where rough stones, or over-burnt brickbats, or lumps of furnace slag and similar material can be readily and cheaply procured, a pretty dividing fence may be erected between the kitchen and flower garden by building those materials with a filling of good soil, up into the form of a low rough stone hedge, about 3 feet high, and from 4 feet in the bottom to 2 feet wide at the top. This hedge will look best, and be most serviceable, if constructed with a scalloped outline toward the flower-garden or lawn, and thus made to form sundry little nooks for choice and tender flowers; the material on this side should also be put together after a studied plan to produce a rough and rustic appearance, leaving holes and pits between the stones for the reception of rock-loving plants. Stone-crop, and fancy varieties of the house-leek, will flourish in any cranny, and many other plants will flourish in those rustic pots when provided with the proper soil. The top of the bank may be planted with sweet-briar, laurel, or any other shrub of low, thick growth, suitable to such a situation.

Fruit gardens, should have their sides from north-west to south-east, protected from wintry blasts by high walls of brick or stone, against which such wall-trees as peach, apricot, nectarine, etc., are nailed. Brick walls will allow of cast-iron nails being driven into them to hold the bits of cloth which support the branches of the trees and secure them to the wall, but such nails cannot be driven into stone walls, except in the joints between the courses of stones, hence it is necessary to point those joints with good mortar to secure a holdfast for the nails. Several devices have been invented to avoid the necessity of driving nails into the walls, amongst which may be mentioned the following: Placing a lattice of iron or wire-work against the wall, and tying the branches to the lattice; driving iron holdfasts into the wall, stretching iron wires or wire-rope along from one holdfast to another horizontally, at distances of 7 or 8 inches apart behind the trees; erecting lattices of woodwork behind the trees, and tying the branches to them;—but experience seems to prove those devices inferior to the old time-tried method of nailing the trees to the wall, for the presence of iron-work behind a wall tree is sure to ruin it, sooner or later, either by inviting an easy path for the escape of electric force from the ground, or providing a rapid conducting-path for heat, both prejudicial to the growth of the plant, and likely to cause electric scorching or a sudden chill at night,

The best and most safe method for stone walls, is to have these constructed with frequent courses of creosoted or pickled planking on the side of the fruit garden, to have those courses projecting fully 2 inches from the masonry, and to nail the trees to the wood. To explain further, before building the wall, have some 9-inch planks split and pickled, build these into the masonry (on the garden side) horizontally, in courses from 6 to 8 inches apart, allowing $2\frac{1}{2}$ inches to be built into the masonry, and 2 inches to project toward the fruit tree. This arrangement will allow the old practice of nailing to be continued, light, air, and solar heat will circulate behind the branches, and the pickled wood will last for many years, instead of requiring to be frequently renewed, as in the case of wood lattices. The method of building brick and stone walls with mortar will come up for treatment when we describe the building and repairing of outhouses.

No better fence can be conceived for the kitchen garden than an openwork wood or iron fence, either built with horizontal rails, perpendicular palings, or ornamental lattice-work, except in those sides facing the north and north-east winds, where a close fence is advisable. The various forms of those fences now about to be described will be found applicable to farm and garden alike, the closeness or distance apart of the rails, together with the general finish of the fence, alone deciding its place on the farm or in the garden.

Post and Rail Fences.—This term is generally admitted to be applicable to those fences formed of wooden posts, inserted vertically into the ground from 6 to 12 feet or more apart, and connected together with wood rails nailed to the posts horizontally. Such fences may be constructed in several different ways, and in a variety of materials. Perhaps the roughest and rudest form of this fence is that shown in Fig. 16, where stakes have been roughed out from forest trimmings, and driven into the ground, and poles tied to them with twisted willow bands, the poles resting in the untrimmed forks of the stakes. The next departure toward progress is shown in Fig. 17, where stout posts have been properly let into the ground at equal distances apart, and poles have been nailed to the posts in a somewhat methodical order. With proper attention to details, this fence may be cheaply and efficiently erected, and will form a most desirable method of enclosing arable and pastural land in sheltered valleys and low countries. Posts for this kind of fence, may be of oak, ash, chestnut, larch, spruce, elm, or birch ; oak, chestnut, and larch being esteemed the best. The wood should be well seasoned, each post have a diameter on the top of not less than 4 inches, nor over 8 inches, and not less than 7 feet in length. Straight wood is preferable to crooked ; but a post crooked at the lower end should not be rejected, since it can be made to incline enough in the post hole to make it stand erect out of the ground. All protuberances should be chopped off with an axe, and the appearance of the posts will be improved by chopping off enough of the upper part, or that which will stand out of the ground, to roughly square this part of them. The post thus prepared, should now have the ground part placed in a strong fire made with brushwood, until this part of the post has been charred and made hot, it must then be plunged into a vessel of hot tar, and allowed to soak in it for a few minutes. The tar should not only cover the part which will be buried in the ground, but also extend to the height of quite a foot above ground. Some persons contend that the bark of the tree alone is a sufficient protection below ground, whilst others claim that a post set with its small end in the ground will last longer than one set the reverse way ; and the writer of " Farm Roads, Fences, and Gates " (a book published by Crosby Lockwood and Co., price 1s. 6d.) gives the following recipe for treating fence posts : " Take boiled linseed oil, and stir in pulverised coal to the consistency of paint. Put a coat of this over the timber, and there is not a man alive that will live to see it rot."

I have not tried this recipe myself, and I do not suppose that my life will be long enough to practically test its value. Fence posts usually decay at the surface of the ground, where both air and moisture unite to promote rot ; and, therefore, whatever preventive measure is employed, this part should receive particular attention. The rails for this fence may be poles of ash, oak, or larch; split or whole, of any length, providing they reach from post to post, or unite three posts together, and, from $1\frac{1}{2}$ inches to 3 inches in diameter. All knots should be trimmed off smooth, but the rails will not require to be squared nor the bark taken from them. Holes for the posts should be dug not more than 9 feet apart from centre to centre, from a foot to 18 inches in diameter, according to size of post, and from 18 inches to 2 feet in depth. The implements required, will be a small crow-bar and a stout spade in stony soils, or a grafting tool, or an American post hole digger in clay or free sandy soils ; a gardener's trowel will also be found useful in cleaning out the bottoms of holes. When the post is set in the hole, see that it is upright in a line with the other posts and with the rails. Kick in some soil whilst the post is held in position to fix it thus, then proceed to fill in the pit, around the post, with soil, and frequently ram it down tight with the end of a short rail. When all the posts are set, proceed to prepare and nail the rails, but first mark their positions on the posts. Five feet from the ground mark

the position of the top rail, and put in four more rails between this and the ground, marking their positions on the posts as follows: 18 inches below top rail, and 3 feet 6 inches from the ground, mark the posts for second rail; 13 inches below this, and 2 feet 5 inches from the ground, mark the post for middle rail; 11 inches below, mark for middle rail; and 1 foot 6 inches from ground, mark the post for fourth rail; 9 inches below this, and 9 inches above ground, mark the post for lower rail. Supposing that the average rail will cover 3 inches of space on the post, the above measurements will give us the respective distances between the rails upwards, of 6 inches, 8 inches, 10 inches, and 15 inches, with 6 inches below the lower rail, and 5 feet to the top of the top rail. If the post selected, is 7 feet in length, and we have sunk 1 foot 6 inches below the surface, we shall have 6 inches of post standing above the rails. This will be little enough to allow a coned top being formed to the post, hence it is best to have posts cut over 7 feet in

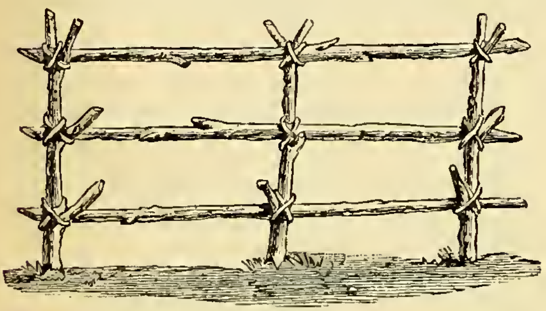


FIG. 16.—RUSTIC AND PRIMITIVE STAKE AND RAIL FENCE.

length, and thus avoid being restricted to exact depth of post hole; surplus wood can afterwards be cut off the top to make the posts uniform in height. If the rails are split, the flat side must be nailed to the post; but, if they are not split nor the post squared, a flat place should be chopped on the post, and a corresponding flat chopped on the rail to fit the post. Holes must be bored with a stout gimlet, and 3 inch spike nails driven through the rail to nail it to the post. In fitting the rails one to another, place the small ends a little above the mark on the post, and let it overlap the large end of the next rail, as shown on sketch. When all the rails are nailed, saw off the tops of the posts to the form shown, Fig. 17.

Fig. 18, is a sketch of a post and rail fence built of sawed wood. The posts are of quartering cut from 11 inch planks to the following dimensions: Length, 6 feet; breadth, $3\frac{1}{2}$ inches; thickness, $2\frac{1}{2}$ inches. Such posts are first converted into stakes by pointing one end. This end is then charred and tarred to a length of 2 feet 6 inches, and the posts, thus prepared, are driven into the ground at distances of 4 feet apart,

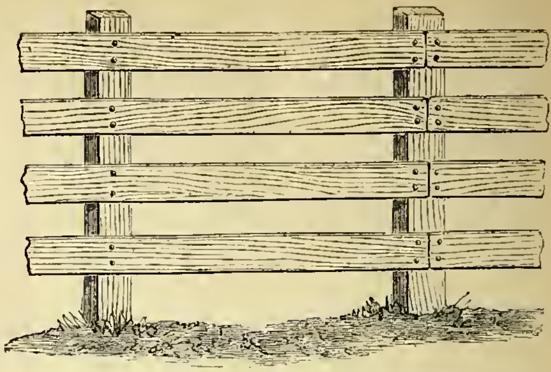


FIG. 18.—POST-AND-RAIL FENCE OF SAWED WOOD

and thus form a row of posts along the line of the fence. The holes for the posts are made with an iron bar named a crow-bar, and the mode of procedure should be as follows: Prepare as many small wooden pegs as will be required to mark off the number of posts in the fence, measure off the distances of the posts, and drive in a peg at every 4 feet length; then go along with the crow-bar, pull up a peg, and deepen the hole to a depth of 2 feet with the bar, occasionally pulling it to and fro in a direction lengthwise with the line of fence, and thus make a taper hole some 3 or 4 inches long at the top. Insert the point of a post in this hole, and gently drive it down with a few blows from a mallet until the point has well entered the hole, then drive the post well down into the hole to the required depth of 2 feet with blows from a heavy billet of wood. Do not use an iron tool, or the post will be split, and as an additional precaution it will be well to get an assistant to hold a billet of wood on the end of the post whilst the few last blows are given. It will be noticed that the posts are inserted with their breadth to the fence, and to this the rails are nailed. If economy of wood is desired, some of the posts may

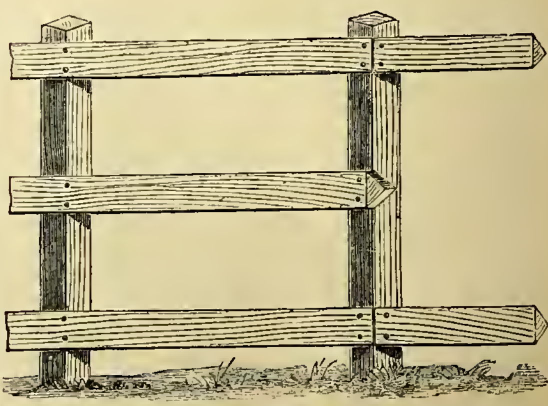


FIG. 23.—SKELETON FENCE OF POST AND ARRIS RAILS.

be cut from 9 inch deals, $2\frac{1}{2}$ inches by $2\frac{1}{4}$ inches. In this case the ends of the rails will be nailed to the larger posts, placed 12 feet apart, and two of the smaller posts will be driven at intervals of 4 feet between the larger posts. The rails for this fence may be cut from scantling or boards, 12 feet by 9 inches by 1 inch. A board of this size will cut into four rails, 12 feet in length, by $2\frac{1}{8}$ inches in width, by 1 inch in thickness. Neither the posts nor the rails are to be planed, but the rough rails are nailed to the posts with 2 inch cut nails, as shown in sketch. After the rails are all nailed, it will be advisable to consolidate the ground around each post by ramming it tight with the end of a billet of wood, and at the same time set the fence straight. The whole fence must then receive two or three coats of coal tar, and should be treated to a fresh coat of tar every five years of its future existence. This fence is suitable as a light divisional fencing between garden plots, or as a defence against sheep and rabbits, when the lower half is protected with wire netting ; but is not safe against the pushing and rubbing of heavy stock.

FIG. 20.—HALF-ROUND POST MORTISED FOR RAILS.

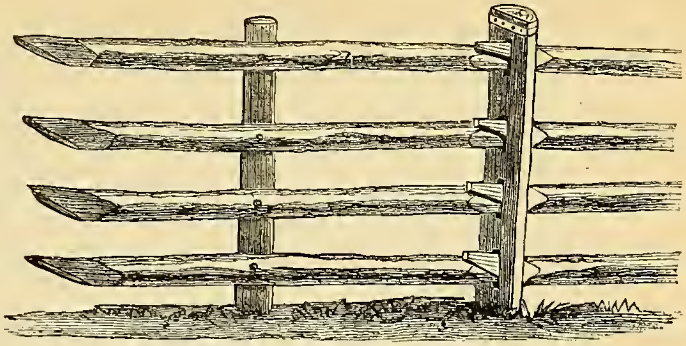


FIG. 19.—RAILWAY POST-AND-RAIL FENCE.

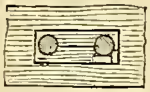


FIG. 21. MORTISE MARKED AND BORED.

FIG. 22. SECTION OF MORTISE.

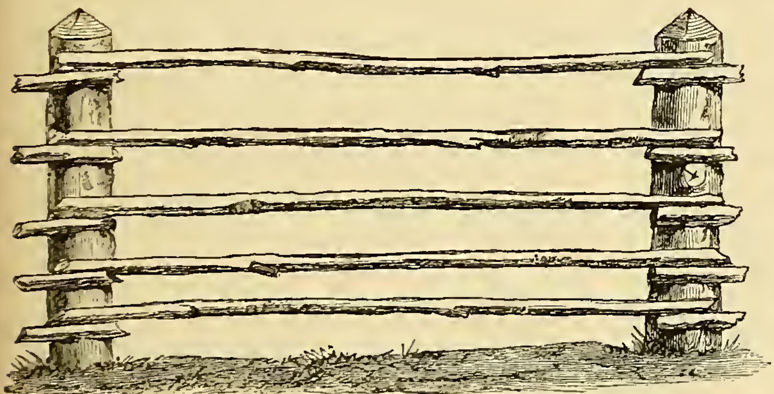


FIG. 17.—ROUGH POST-AND-RAIL FENCE FOR FIELDS.

Another and still lighter form of post and rail fence made entirely with sawn quartering is shown in the sketch Fig. 23. In this form the ordinary $2\frac{1}{2}$ inches by $2\frac{1}{2}$ inches quartering is used both for posts and rails, the latter being formed of quartering cut lengthwise across the diamond or from corner to corner of the quartering. The posts are inserted with their corners to the

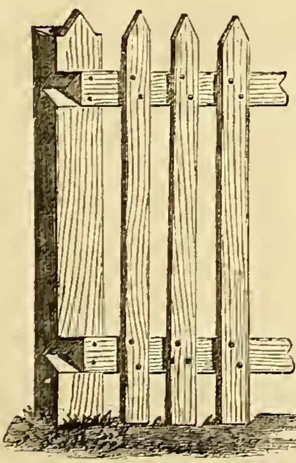


FIG. 24.—OPEN PALING FOR GARDEN.

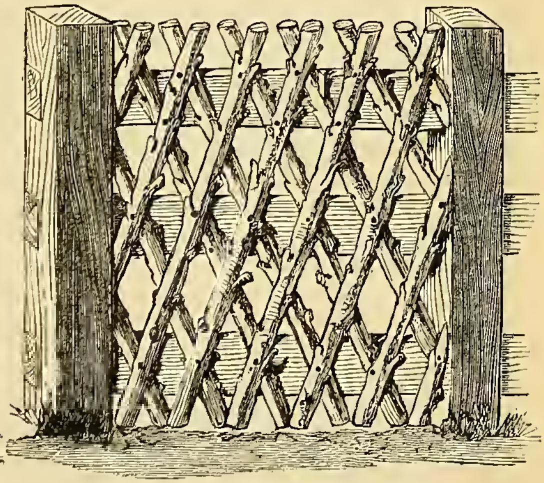


FIG. 25.—FANCY RUSTIC FENCE FOR GARDEN.

rails, and three-cornered or half diamond notches are cut with a saw in the posts to receive the corners of the rails. Skeleton fences thus constructed, form a cheap method of marking boundaries, and also as supports for wire netting. They have the advantage of close fences, in allowing a full and free play of air and light amongst the enclosed growing crops; and will last for many years with care and fair usage. If a close paling fence is required at any time, the skeleton fence will form a frame to which the palings can be nailed.

One of the most cheap and easily constructed post and rail fences is that shown at Fig. 19, and named the "Railway Post and Rail Fence," because it is largely used as a fence for English railways. It is constructed entirely of fir wood in its rough state, the posts being of split fir or larch trees, and the rails of split larch poles. The posts, as will be seen on referring to Fig. 20, are split from fir logs some 6 to 7 feet long, are bound around the upper part with a band of hoop iron to prevent the posts from splitting, and are pointed like a stake at the lower end. The ends of the rails are secured in mortises cut through the posts as shown in sketch, and thus, few nails are required. A few words on the way to use a mortising chisel and a mallet on the present job may not be out of place here, whilst the practice will get our hands in the way of doing other jobs. First, mark out the mortises as follows:—Three inches from the top of the post, on the bark side, mark a line straight across with a lead pencil or a sharp steel point; four inches below this, mark another line across the post, unite the two lines with another drawn exactly down the centre of the post so as to form a capital I, then draw two lines on each side $\frac{3}{4}$ inch from the central line and thus enclose an oblong space 4 inches by $1\frac{1}{2}$ inches with a central line running through it. The two end lines and the side lines will mark the size of the mortise, whilst the central line will mark the point where the auger must enter. Mark a similar space 10 inches below the top mortise; another, 10 inches below this, and another, 8 inches below this last; the post will then be spaced out as follows: from top to first mortise 3 inches; then, first mortise, 4 inches; from this to second mortise, 10 inches; then, second mortise 4 inches; from this to third mortise 10 inches; then, third mortise 4 inches; from this to fourth mortise 8 inches; then, fourth mortise 4 inches; from this to ground 7 inches—in all, 4 feet 6 inches above ground. Next, place the post on the ground with its flat side downwards and bore a hole in each end of the marked space, placing the point of the auger or the centre bit on the central line and bore the holes straight through. In this way much subsequent labour will be avoided in clearing out the ends of the mortises, as the chisel will clear itself of the chips as they are cut away. Bore holes through all the mortises in this way, then place the post across two trestles, get astride the post, and, with chisel in left hand and hammer in right hand, proceed to cut a clean four-sided oblong hole straight through the post; but before the opposite side has been reached, turn over the post and cut from the flat side to ensure a clean finish on both sides. The method of boring the auger holes, and, a section of a mortise, is shown at Figs. 21 and 22.

The rails for this fence, are larch poles 7 feet in length and 3 inches in diameter at the largest end, split and thinned, and cut with a hatchet at both ends to the shape shown in Fig. 19; the small end being sloped off in an opposite direction to that of the large end. In building this fence, commence at one end, and sink one of the stoutest and longest posts by making a hole with a crowbar and driving down the post with a heavy wood billet; then drive a strut into the ground behind the post and nail it to the post to assist it in withstanding the end thrust of the rails. At a distance of 6 feet from the first post insert another, but do not drive it in firm until the first set of rails have been fixed, then drive in the post and wedge up the rails in the mortises of the first post. Thus proceed, building in posts and rails and making all firm until the line of fence is complete, then go along the fence on the side where the rails present a flat side, and drive in a rail half way between each post as shown at Fig. 19, nail it to the rails and cut off all superfluous wood on the top. Finally go over the whole with a coat or two of good coal tar. The fences, Figs. 17 and 18, may be similarly constructed, and will outlast any nailed fence. Best fences of this grade do not have their posts driven into the ground as stakes and piles are driven, but the posts have thick and heavy feet which are sunk in properly dug post holes after being charred and prepared as before directed for the posts of Fig. 17. Fences of oak or chestnut posts mortised and fitted with larch rails and then tarred, are most endurable, and the work of preparation can be carried on indoors during the wet cold days of winter when out-door work cannot be done.

At Fig. 24 is shown the amateur's method of building a garden fence with short pointed palings. A fence thus put up, is strong and easily constructed, but it would be equally strong and present an improved appearance if the posts had been mortised instead of notched, and the horizontal rails had been fitted in with a tenon joint. Sawn or split quartering has the advantage of preventing a lodgment of wet and dirt, this preserves the rails from rot, but whole quartering makes the best tenon joint. In jointing the horizontal rails for this fence, they should be placed far enough

back from the faces of the posts to allow these to come in line with the vertical rails or palings when they are nailed on. The posts may be 6 feet apart and the rails or palings 2 inches apart, these last being quarters of 9 inch by $\frac{3}{4}$ inch boards, planed smooth. The height of the fence must be determined by the requirements of the situation, but the ordinary dividing garden fence of this kind rarely exceeds the height of 4 feet. Higher fences should have two horizontal rails, and a pleasing variety is formed by having each alternate paling long and short, nailing the short palings to the middle and lower horizontal rail, whilst the long palings are nailed to all three rails.

A pretty and strong fence for gardens is shown at Fig. 25. This fence is built with a skeleton of stout squared oak posts, properly prepared and sunk into the ground some 6 feet apart; these are connected at the back with three horizontal oak rails let into the posts as shown at the end, and the fence is completed by nailing roughly trimmed short lengths of small larch poles across the rails in two layers to form a diamond pattern. This fence will admit of a few variations in method of construction, and will perhaps look best from both sides when the rails are mortised into the centre of the post and the transverse larch poles are nailed to both sides; in this case the rails may be lighter than when the first plan is adopted. In another variation the direction of the transverse larch poles is reversed in each panel of the fence. In still another they are laid on both sides to form a diamond in the centre of each panel. This fence should not be tarred or painted, but looks best in its rough rustic state, protected with a coat or two of oak varnish.

(*To be continued.*)

HELP FOR STRUGGLING AMATEURS.

By PITCHPINE.

II.—MY CARPENTER'S BENCH: HOW I MADE IT, AND WHAT IT COST ME.

I HOPE that since our last chat together, you have been successful in making a satisfactory bargain, and have succeeded in purchasing at a reasonable price, the tools which I suggested for the first investment, and which we shall require to use in the construction of our bench. If so, we may as well take off our coats and set to work. I have not forgotten that it is not to cost more than about twelve shillings, and as this is what I managed to make mine for (and a very useful servant it has been), I think I shall be able to justify my promise. As the bench is all put together with screws, it is easily taken to pieces in case of removal; or if, at any future time, your ambition soars to loftier heights, and you decide upon discarding your old friend in favour of a more highly finished article, the timber can easily be used for other purposes. Though if you feel as I do in the matter, you will think twice before turning the cold shoulder upon an old and trusted servant who has stood by you through many failures and successes.

It is time, however, that we left sentiment to devote ourselves to work; and to begin with, turn to Fig. 1, which represents the bench as it stands completed. It is not drawn to scale, for as I shall give the dimensions of each piece as we come to it, I did not consider it necessary; and as it is, it will be quite sufficient for all practical purposes. If you examine it closely you will easily see what the method of construction is, simply to make two tressels, one for each end; two planks are placed across these for the top, a plank also being screwed on to front and back. It is also further steadied by pieces between the bottoms of the legs or tressels. All this is very simple, and the only thing that requires your very special attention, is to keep everything absolutely square and true, if you wish to turn out a strong and steady bench, free from shake or other sign of weakness.

You commence by making the tressels, one of which is shown in Fig. 2 on a rather larger scale, so as to give a clearer idea of its construction. The uprights or legs are $28\frac{1}{2}$ inches high, and 3 inches square in section; the cross pieces A, B, C, D, are 3 inches wide, 1 inch thick, and $19\frac{1}{2}$ inches long. Lay the two legs on the floor parallel with each other, then put the piece B in position, as shown in Fig. 2, and fasten it, for the present, with one screw in each end only. Now put on the piece D, 3 inches from the bottom, and fasten this in the same way. With your square try if these pieces are at right angles to the edges of the uprights, and then put in the other screws. Turn the legs over and put on the cross-pieces A and C, the top edge of the piece C being 9 inches below the bottom edge of the top piece A. Cut two pieces 20 inches long, 3 inches wide, and 1 inch thick, and screw on to the outside of each leg as at E and F; these pieces are put on for the purpose of bringing the outside surface of the four legs flush with the cross-pieces which connect the tressels at front and back, J and K, Fig. 1. This finishes one tressel, and you can make the other exactly like it. Now stand them upright and screw on the top boards, which are each 6 feet long, by 11 inches wide, by $1\frac{1}{2}$ inches thick. This would make the top of the bench 22 inches wide, but it will be necessary to plain the rough edges of these boards, which will make the top finish $21\frac{1}{2}$ inches wide. It is not absolutely necessary to plane any other part of the bench, but it is advisable at any rate to smooth

down a little of the rough surface of the top and front boards. These top boards should be put on with four 2 inch screws at each end; two being put into each of the cross-boards A and B, Fig. 2; and when in position, will project 1 inch over the tressels at the front and back, and 4 inches at each end. The bench will now stand upright, but will not be very steady until you have screwed on the front and back boards, J and K, Fig. 1, which will be the next thing to do. These boards are each 11 inches wide by 1 inch thick, and the same length as the top boards. A notch is cut as shown in Fig. 1, to allow them to fit over the pieces E and F, Fig. 2. It will probably occur to you that it would be easier to make the pieces E and F shorter, and so allow the front and back pieces, J and K, to rest upon them; but, the notches, if a good fit, tend to counteract the thrust of the bench from end to end, and thus assist in giving rigidity, which is absolutely necessary in all benches that are used in carpentry.

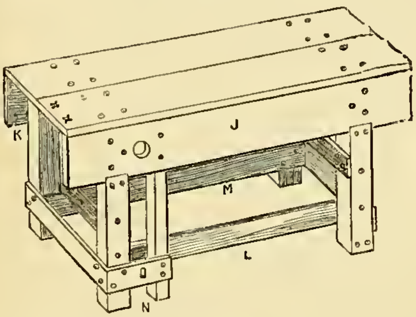


FIG. 1.—CARPENTER'S BENCH, COMPLETE.

In order to render the bench as stiff and rigid as possible, the two pieces, L and M, Fig. 1, are now screwed on, with two screws in each end, inside the legs. These pieces are 3 inches wide, by 1 inch thick, by 5 feet 4 inches long.

A couple of screws driven in near the end, as shown by the marks X, X, will serve as a stop to place the end of any piece of wood against while planing the surface. A very good iron bench stop can however be purchased for a shilling, and is much more satisfactory to use than the screws, as it always remains firm, while the screws soon work loose. The bench stop also can be adjusted to suit any thickness of wood by a simple turn with the screw-driver.

The bench itself is now complete, but when we wish to square up the edges of a piece of wood, some sort of vice, or an equivalent, will be necessary for holding the work in a vertical position. A vice does not cost much, and is greatly superior to any substitute; I should therefore recommend you to make one. You will have to purchase a screw and nut, which will cost 1s. 6d. or 2s., and which is shown in Fig 3, which is an illustration of the vice in position, G being the top of the bench, and H the cross-piece at the bottom of the legs.

The front jaw, or chop, as it is called, is shown in front elevation at Z, in Fig. 3, and is cut out of board $1\frac{1}{2}$ or 2 inches thick. A round hole, large enough to admit the screw easily, is cut in the position shown in chop at Y, a corresponding hole being cut in the front board of the bench, as shown in Fig. 1, bearing in mind that the top of the chop must be exactly level with the top of the bench. The nut is now attached by screws to the back of the front board of the bench, the centre of the hole in the nut coinciding with the centre of the hole in the front board.

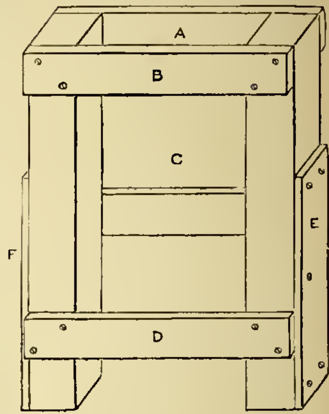


FIG. 2.—TRESTLE FOR BENCH.

It has now to be provided with a runner, shown at H, Fig. 3, by dotted lines. This consists of a strip of wood 2 inches wide and $\frac{3}{4}$ inch thick, with a row of holes in it about 2 inches apart, to receive a pin, which may be a bit of $\frac{1}{4}$ inch iron rod. This is mortised into the lower end of the chop. A strip of wood 1 inch thick, 3 inches wide, and about 12 inches long, is screwed on to the bottom of the leg at N, Fig. 1, a notch being cut in the piece E, Fig. 2, to admit it; a piece the same thickness as the leg, but half as wide, is screwed on to the inner side of J, which receives the other end of the strip N, as shown. A mortise hole is cut in this strip, through which the runner slides, and is held in any required position by the iron pin, according to the thickness of the work to be held by the vice.

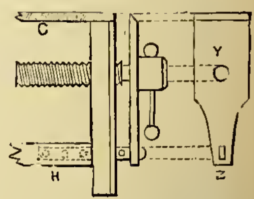


FIG. 3.—BENCH VICE.—SIDE VIEW, WITH FRONT ELEVATION OF JAW AT Z.

You are now in possession of as good and useful a bench as any one need wish for, and you will find that the cost has not exceeded the estimate I gave you. By the time you have finished the construction of this very necessary part of your outfit, I shall hope to have an opportunity of writing a few more suggestions, which I trust may be of service to my brother amateurs.

(*To be continued.*)

HINTS FOR FRET-SAWYERS.

By Q. E. D.

IN offering the following connected hints for amateurs in fret-work, I must preface the same by saying I am fully aware they are open to adverse professional criticism; but that they are written by an amateur for amateurs only, who having but very few of the many appliances belonging to professionals, or, indeed, the skill to use such appliances, are obliged to make up their work in an amateurish way.

It is needless for me to enumerate the different articles required for a commencement. I would, however, recommend, from the beginning, the use of a saw-frame, of 14 inches in the bow. The pressure of the frame against the arm gives steadiness to the cut, and with such a saw-frame, large pieces of fret-work can be cut out. In the same way, a good-sized fret-board is an advantage. I always use one $9\frac{1}{2}$ inches by $16\frac{1}{2}$, shaped as shown in cut, to clamp either side, on the side of the bench; the smaller hole being used only in cutting very short lengths of fret. A good-sized shuting-board is another requisite, and one of Buck's single iron iron-planes, about 2 inches by 6 inches, set reverse way, as a chisel is used, is invaluable for cutting bevels: set thus, it can be slowly used, without fear of chipping pieces out from the ends, when going against the grain. Many different numbers of fret-saws are quite unnecessary. Good Nos. 1 and 2 will answer all purposes, and cut from $\frac{1}{8}$ inch to $\frac{1}{2}$ inch in wood. I am alluding only to cutting with the hand-saw. The best Nos. 1, 2, etc., can be obtained at 3d. the dozen, or 3s. the gross.

SHAPE OF FRET BOARD.

As regards patterns, the foreign patterns are excellently printed, and accurate; but, to my taste, too fantastical, and, like the American patterns, have too many human figures introduced. The American patterns are not well printed, and, I find, often inaccurate in their measurements. For artistic design, good printing, and perfect accuracy, the best I have ever had—though there may be many others—are those of Booth Bros., *Dublin*, and Henry Zilles, 14. *South Street*, *Finsbury*, *E.C.* There is, however, much scope still left for the designer and seller of patterns, if they would recognize that even an amateur tires of toy-like designs, and would gladly welcome such patterns and designs as one sees in the brackets, tables, overmantels, etc., etc., in the better class of upholsterers' windows.

The amateur should carefully scan any pattern he intends cutting; for in the best, and when the cutting is to be in thin wood, there may be many parts, which by carrying on to a point of junction, will strengthen the pattern immensely, without in any way detracting from its appearance. In like manner, he should test the measurements. In "Amateurs in Council" certain correspondents have recommended for the reproduction of designs, that the patterns should be floated off or heel-balled. To the first, there is the objection that so soaking the wood does not improve its grain, and the paper, from much wetting, is apt to stretch. As regards heel-balling, it will reproduce any inaccuracy in the cutting, and, besides this, it is generally even then necessary to mark the outline with pen and ink. Either of these systems answer very well if in a hurry, or for a small design; but I take it an amateur's work is also his pastime, and the best way of reproducing designs is to trace, with pen and ink, as many copies as he may require from the printed design, on tracing paper. He will thus ensure perfect facsimiles, and cutting out such tracings is far less trying to the eyes than the heel-balled patterns, or, in fact, than the black full printed patterns. Tracing paper, good enough for this purpose, about 2 feet wide, can be purchased at 6d. per yard.

I think the best wood, taking it all round, is good close-grained Honduras mahogany. It is easy to cut, its tendency to warp is slight compared to other woods, and when darkened, like old Chippendale furniture, is very handsome. The best way to purchase it is from a timber merchant by the piece, and get it planed down by a carpenter, if the amateur objects himself to this trouble. The price should be, for $\frac{1}{4}$ inch, about 5d.; $\frac{1}{2}$ inch, 8d.; and 1 inch, 1s. the square foot. It is better, perhaps, to obtain $\frac{1}{8}$ inch woods, ready cut, gauged, and planed. A correspondent has said, in "Amateurs in Council," that mahogany will not ebonize well; but cabinet-makers, as far as my experience goes, would state the contrary, and I have never found any difficulty in so doing. For thin cuttings, a harder wood is better, such as walnut, Italian, or black American. For ebonizing, to my notion, nothing equals sycamore and plain maple, but they are very hard to cut if over $\frac{3}{16}$ inch thick. Holly is very easy to cut and stains well, but warps very much. Pine is not worth using by an amateur for fret-work. Oak makes up well, and can be darkened by applications of soap lye, to be obtained at chemists.

An extremely easy, cheap, and thoroughly efficient way of ebonizing, is to take one pennyworth of logwood. Make a strong decoction from the same, say to about half a pint of water, go over the work with this while hot, let dry, and again repeat. After the second damping, and before dry, add one pennyworth of the best green copperas, and, when dissolved, go over the work with this mixture; the result will be a

blue back. A second damping of the mixture should be given, and the work, when oiled or polished, will be a good permanent ebony colour, with the interstices thoroughly stained.

Many excellent ebony stains are sold, Jackson's, Stephens', etc.; but, to my mind, Fordham's is the most satisfactory, as it leaves the interstices shiny, and thus saves the tedious work of having to oil or varnish, in between each, besides being less obnoxious in smell!

To darken mahogany to a rosewood or Chippendale colour, one pennyworth of bichromate of potash, dissolved in hot water, will make about two quart bottles of solution, two applications of which, with a brush, will produce a good colour, and the rest can be kept for future occasions. The work, when dry, will look a dull brown, but French polish, varnish, or oil, will bring up the required colour. Its sufficiency before polishing can be tested by damping a part.

I take it all amateurs wish to make up their own work. The best hint I can give is that they should entirely make up the article they are constructing, if possible, before fretting; fitting the fret pieces in the plain wood, of the thicknesses intended, then take the latter to pieces again, paste on the patterns, and proceed to fret. By so doing, there is less chance of breakage, and the patterns can be better adapted to the work. Of course, there may be such things as brackets, frames, etc., which cannot be so managed; but even in the former, the shelves can be fitted and screwed on, and the side-pieces put together and in frames, the beadings made and adjusted. Though $\frac{1}{8}$ inch wood is thick enough for any inletting pieces of fret, or rails, etc., I would recommend not less than $\frac{1}{4}$ inch to $\frac{3}{8}$ inch for sides of brackets, and whatever can be allowed up to $\frac{1}{2}$ inch for shelves. This will permit the edges of the latter being lined or bevelled, which improve the effect, and the greater solidity thus obtained, improves the article.

The amateur will find the use of fine screws a great assistance, even when gluing also. They permit of the work being put up and taken to pieces again. If in front of the work, by countersinking the heads, they can always be covered by a light beading, which latter, improves the appearance, and is easily applied by needle points and glue; the former are sold by all ironmongers. Nettlefold's No. 1—$\frac{1}{4}$ inch, $\frac{3}{8}$ inch, $\frac{4}{8}$ inch, and $\frac{6}{8}$ inch screws can, with the aid of the drill, be screwed into very fine work, and cost but 6d. the gross! Of course, for larger work, as shelves, proportionately larger screws should be used. For covering screw-holes at sides of book-shelves, a wooden turned button answers well. Few of us possess lathes, and to get a few such buttons specially turned, is giving the turner a job that does not remunerate him, is dear to the amateur, and he may have to wait days till he gets them. In most turner's shops, the amateur will generally find bowls full of ready-made little drawer handles; by cutting off the heads, they make capital stops, and can be bought very cheap.

For beginners only, I offer the suggestions, that the holes in the pattern should be drilled sufficiently large to take the saw-blade easily. This, especially in heavy pieces, prevents saw breaking in threading. If the wood is sufficiently thick, cut from and to a point of the pattern; if thin or weak, to a corner. In pieces too large to turn in the frame, drill the holes at the outward extremity of the piece to be cut out, cut all you can, then back and start again. The inside pieces of all patterns with a fretted edge should be cut out before cutting the outside off. After pasting on the pattern, on all unmade up pieces, drill any necessary screw holes before fretting out. This saves many a fracture; and, lastly, let the beginner think out his pattern, and decide how he will contrive to put it together, before commencing at all.

Having done all else, there remains the French polishing, varnishing, or oiling. On this head I would say never varnish if you can French polish. No better directions for the latter could be given than are contained in page 248, Vol. II. of AMATEUR WORK. I am always deterred from using a wood-filler, as they are all more or less of a messy nature—a great drawback for open fret-work. I therefore, at a greater cost, and more expenditure of time, fill up first with white spirit varnish, rub down, and continue French polishing till the grain disappears; but if the amateur can obtain a wood-filler he can "cleanly" use, by all means let him so do. For ebonized woods, white French polish is best. To obtain a dull polish, after the French polishing is perfectly dry, rub with a soft pad and powdered pumice-stone, going lightly up and down the way of the grain. Such parts as cannot be so treated rub with a hard brush. If after the French polish is dry, there may be any finger-mark smears, etc., from after handling, soak a piece of wadding with French polish, cover with clean rag, moisten that again, and smoothing the pad in palm of left hand, pass lightly with the grain a few times up and down the work, taking care not to dwell. No oil should be used in doing this.

I am afraid I have already taken up too much space with these homely hints; but if they should prove of the same service to beginners as they would have been to me when I first commenced, my purpose will have been answered. It takes some time to get at all these points, *via* personal experience, and hence the practical value of the "word in season," which often proves a royal road through many a difficulty.

PRACTICAL LESSONS IN WOOD-CARVING.

By E. ARTHUR EDWARDS.

III. — BOOK-SLIDE — PRELIMINARY CARPENTRY — TWO EXAMPLES FOR PRACTICE.

IN accordance with my promise, I now propose to go more fully into the method of carving in low relief, and have accordingly prepared designs for a book-slide to work upon. As with the inkstand (already, I hope, finished and generally admired) the preliminary carpentry is of a simple nature, and in this case all that is required is a base 20 inches by 8 inches by $\frac{3}{4}$ inches, and two ends, each 8 by $7\frac{1}{4}$ by $\frac{3}{4}$ inches. If it is proposed to have a "library set," composed say of the two articles already mentioned, together with envelope-case, letter-racks, paper-knife, reading-easel, etc. (most of which I hope to treat of hereafter), they should all be of the same wood; and to English or Italian walnut I decidedly give the preference, but this is a matter for the consideration of each one's individual taste; and as long as it harmonizes with the surroundings it is of no great importance what wood is chosen. A plain base of the dimensions indicated will be quite sufficient for all purposes, but should anyone like to give a more workmanlike appearance to it, a framework should be made as in Fig. 8; as it does not involve carving, pure and simple, I will leave the details to the practical comprehension of my readers, and content myself with a self-explanatory sketch, which exhibits the construction sufficiently clearly to enable any one who wishes to make one to do so. If there still be any difficulty, it may be cleared up by purchasing and examining one of the book-slides that are sold by most stationers who keep fancy goods, at about 1s., or 1s. 6d. at the utmost.

Two designs, suitable for the ends of the book-slide, will be given in the next chapter. For the present the amateur wood-carver, who is following my instructions, will find sufficient employment in making the framework for the base of the book-slide, and in executing two preliminary pieces of work, which are shown in Figs. 9 and 10, and which will serve as suitable studies in wood carving before entering on the more elaborate work involved in the ends of the book-slide. The remarks that I am about to make will apply equally as well to the designs to be given with the next chapter as to those that are given here.

Suppose, then, that we have the patterns shown in Figs. 9 and 10, copied on tracing paper and pasted on suitable pieces of wood. Suppose, also, that we are working inwards from the oval lines that forms the boundary of each of these figures, and that the wood without this line retains its original level. We commence with process No. 1 of "cutting down," as described in my first chapter, until a depth of $\frac{1}{8}$ inch is obtained. We shall have to go to a greater depth than this, and it may be both convenient and desirable to say here that in the case of the examples before us the ground should be gradually sloped inward, from the oval boundary line, until it reaches the pattern, which is left in relief in a slightly saucer-like depression, which, as I have said, serves as the ground. Let us suppose that the depth of the ground at the pattern is $\frac{3}{8}$ inch.

Having got thus far we may say a few words as to "blocking out." We have cut down to $\frac{1}{8}$ inch and have to remove all the groundwork to three times that depth: turn the wood sideways so as to cut with the grain, and instead of slicing away all the ground in a block, start close to the leaf or stalk primarily, and cut down a little trench to the bottom of the $\frac{1}{8}$ inch, as in Fig. 9, then go over the whole of the operation again, cutting down the remaining $\frac{1}{4}$ inch and widening the trench to the bottom of the second cut. In this sketch I have shown the trench as it would appear with each succeeding cut of 1 or 2 G. In the second edition of this process the cuts are deeper and wider, and narrow pieces, such as M, N disappear altogether. This brings us to the full depth required, and gives a gap all round the first "block"—as I call each portion enclosed by two or three leaves, stalks, etc. Before going any further a few turns on the hone and a little stropping will be requisite. Then, still with 1 G held at a very acute angle with the wood, level off all the remaining ground within the block: it will doubtless be difficult at first to obtain a flat surface, and if a few inequalities appear, they had better remain for the present; perhaps they can be touched up afterwards with 1 B C when the rest of the blocking out is finished. Now commence in precisely the same manner with the next block, taking care not to go to a greater depth than in the first, and so on, one by one, until the whole are finished, and where they nearly join, comparing the depths to see that they agree as nearly as possible. The edges—more particularly of the thinner stalks—need not be quite perpendicular at first, as if they slant outward a trifle there will be less danger of their being cut through; but when this stage is completed they should all be touched up and the edges of leaves and stalks made sharp and accurate. I think it better to persevere in the use of 1 G than to take to a bent tool for blocking out, except in the narrow spaces between leaves, etc., where only 1 B C will penetrate, and it is advisable to keep the groundwork in the middle of each block lightly higher than at the sides, so that it can be

subsequently cleared away if necessary; filling up being out of the question in carving.

In the case of berries (which will be found in one of the examples to be given for the sides), or other such small work, make a line round the whole bunch in the first place, and do not attempt to cut each berry separately until all the rest of the carving is finished. Should the wood show a tendency to split or tear at any point, turn it round and work in the opposite direction, and throughout this process the axiom "vertical cut deeper than the horizontal," must constantly be borne in mind. It will be a mere trifle towards the finish, so as not to gap the groundwork too much, but otherwise little chips will be left in the corners and the clean appearance of the work sadly marred. But do not be disheartened if this result is not obtained just at first, the tools are sure to leave their marks behind them, and these little irregularities will disappear by and bye perhaps. In summing up the directions upon the blocking out process, I again insist upon the necessity of cutting (1) continuously, *i.e.*, each downward stroke must extend into the succeeding one; (2) deeply, *i.e.*, so that the vertical cuts are deeper than the horizontal; (3) of obtaining a perfectly even level ground throughout. If these instructions are closely adhered to there should be no risk of failure in this more mechanical part of the work; but in the next instalment, being purely artistic, success can only be attained by experience. With an easy pattern, however, there need be no fear that creditable work will ensue.

In Fig. 10 I have attempted to show something of the method to be adopted at the commencement of carving a leaf, and it consists in making a series of grooves of varying depths and directions, entirely according to fancy. Choose a good broad one somewhere in the middle, extending almost from end to end, then make two or three more, as a general rule following the directions of the larger veins, but Fig. 10 will give a good idea of how they may range. Now with a large flat gouge pare down the sharp edges of the grooves, and where they almost amalgamate cut away by very slow degrees the intervening ridge until it nearly disappears. If the grooves have not been made too much alike a good idea will be formed of the contour of the leaf, though the work is not by any means finished yet: it is probable that each stroke has left two lines behind, formed by the contact of the tool with the wood, and the deeper and bolder the stroke the more pronounced these lines will be; but it must now be our care to get rid of these, and so reduce the rough uneven surface, almost to resemble that of the ivy leaf in its smoothness.

It is only by laborious patient care that this result can be attained, but the ultimate effect amply justifies any amount of pains being expended upon it, for almost everything depends upon the finish in carving. To impart this an infinitesimal number of minute cuts must be made wherever any angle formed by two or more tool marks obtrudes itself, the smaller they are the better; and the wood must constantly be turned

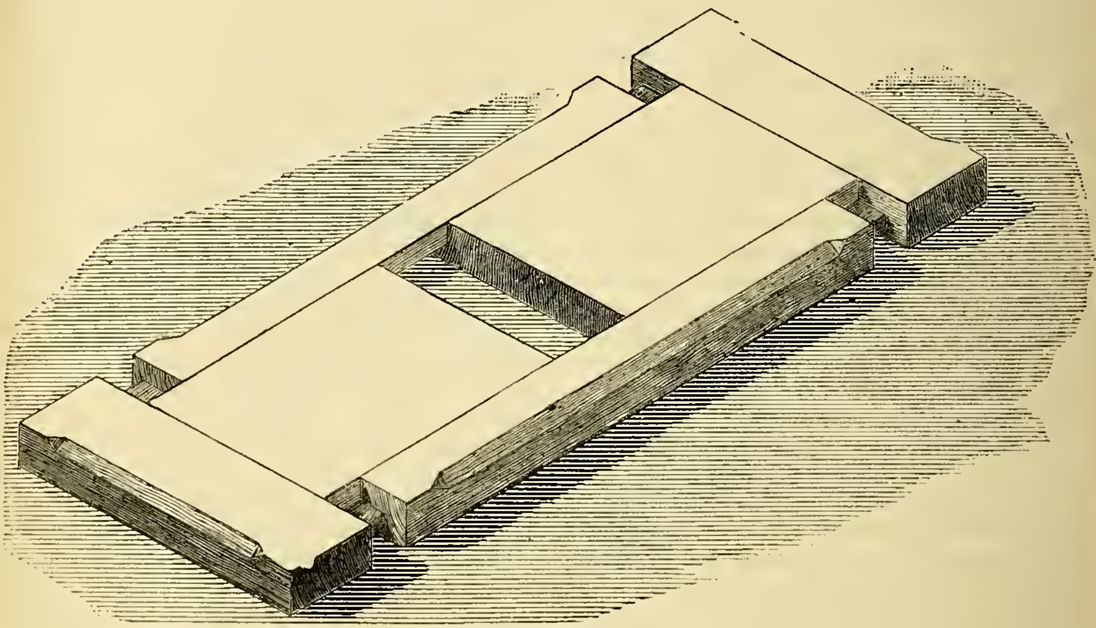


FIG. 8.—DIAGRAM EXHIBITING CONSTRUCTION OF FRAMEWORK FOR BASE OF BOOK-STAND.

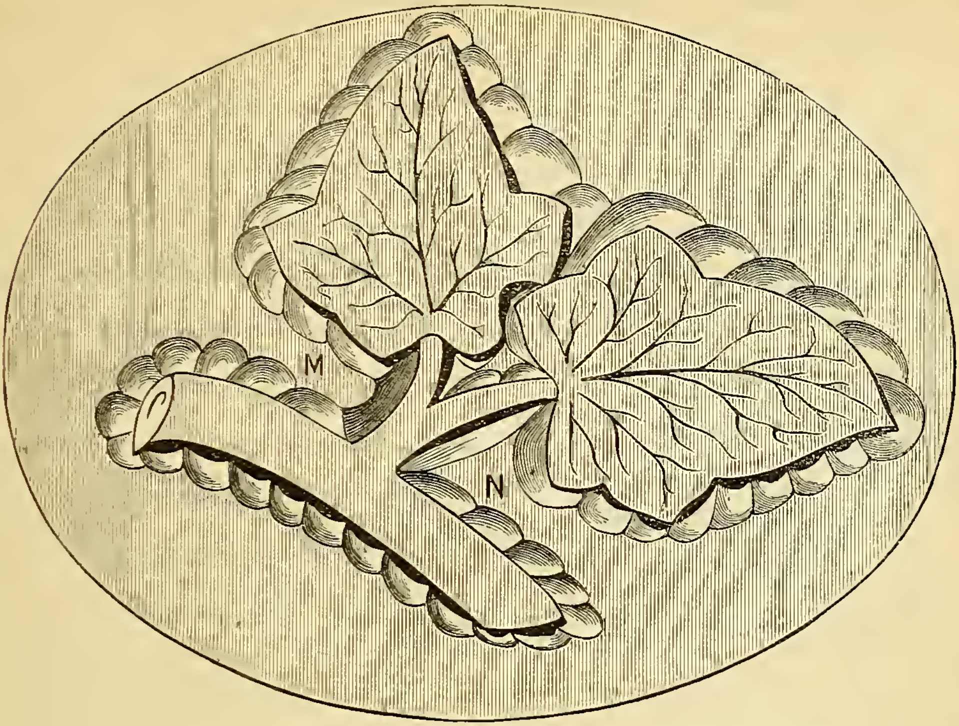


FIG. 9.—EXAMPLE OF "BLOCKING OUT" ROUND PATTERN IN WOOD CARVING.

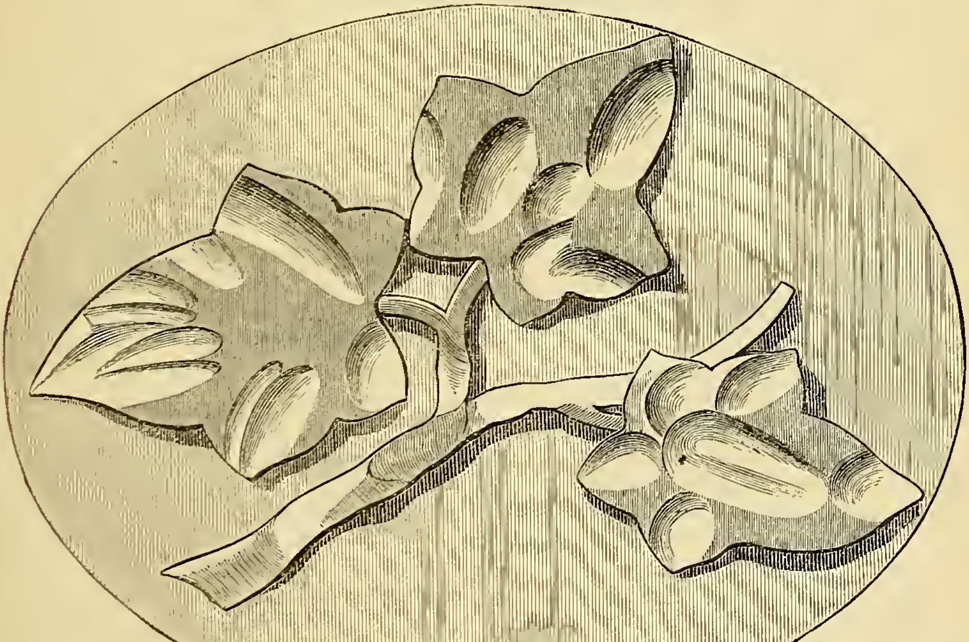


FIG. 10.—EXAMPLE OF METHOD TO BE ADOPTED AT COMMENCEMENT OF CARVING LEAF.

round in several directions to get the light thrown upon the work from every point of view.

Do not be satisfied with any hasty imperfect work in this important stage, or the result will be far from satisfactory, but let each leaf, as the work progresses, be an improvement upon the last, and then return to the earlier efforts as practice ripens into experience.

In a former chapter I said a few words on scraping as a short cut over these difficulties, but I still advise those who are gifted with patience not to resort to that process where it can be avoided, for at the best it is only a makeshift, and as such should seldom be employed.

The stalks next demand our attention, and will require a good deal of careful work to look really artistic. In the first place, each stalk must be rounded off with a medium gouge, and those forming the boundary undercut to the extent of two-thirds of their circumference; turn the wood upside down to accomplish this. Let us take, for example, the main stalk from its starting point upwards; make a slight incision, marking the breakage from the stem and hollow out to the apex, which should be on a level with the groundwork. Tear off a moderately thick piece of ivy from a tree, and observe its appearance if this instruction is not sufficiently lucid. Then in the stalk itself make a series of long hollows at various intervals and positions, and round off the edges of these as with the leaves; wherever a junction occurs let the angle of departure be sharp and well defined, and where the stalks intersect let the lower one pass well underneath the upper.

And now for the important question of veining which is to impart to the work the life-like characteristics it has hitherto failed to possess. I should advise the tyro to try his hand on a specimen leaf before attempting anything further, and roughly sketch out one of the larger leaves as a pattern. It will be found to require a lot of practice before the veining tool appears to work easily; it must be held in the right hand very firmly, and guided by the left forefinger. The main veins should all be deeper at the base than at the apex, should branch off from a point near the base, terminating just within the extremities, and should all be slightly curved. The design will best show where the smaller ones may be placed, and great care must be taken that these start only from the main lines, and that no scratch marks their departure on the opposite side of such main line. Then when the leaves are satisfactorily veined the stalks must be similarly treated, though here the incisions are not continuous along the whole length of the stalk, they should seldom be more than 1 inch in length, and should turn about in all directions, disappearing under the stalks apparently, and commencing on the opposite side. It is a good plan sometimes to put three or four in a group, all having the same direction but of different lengths and depths. A very fine finishing effect is gained by holding 1 G very lightly between thumb and forefinger, gently pushing forward at an angle of 30° and quickly twisting it backwards and forwards at the same time. This is easier perhaps than it looks on paper.

(*To be continued.*)

FISHING TACKLE:

ITS MATERIALS AND MANUFACTURE.

By J. HARRINGTON KEENE.

III.—RUNNING LINES AND THEIR DRESSINGS—REELS AND THEIR FITTINGS.

HAVING thus given pretty full information in respect of what may be called the raw *material* of fishing tackle—viz., hooks, knots, gut, hair and gimp—I think it is time to rise a step higher, and refer to the running or rod lines in use, with their dressings and preparation. Now, first, let me say that no one without special machinery and skilled labour of a most expensive kind, can hope to compete with the great line-making centres, Nottingham, Manchester and Redditch. Nottingham is, *par excellence*, the home of silk line-makers, and when you can go to Walter Wells of that city, or to Martin, 4, *Northern Buildings*, *Newark-on-Trent*, and get a beautiful eight plait (undressed) line for about three farthings a yard, retail, it is patent to all that to endeavour to make one yourself with a profit, would be sheer madness. This is one of the exceptions against making your own tackle, to which I referred at the commencement of these articles. The Twine and Cotton Spinning Company at Manchester, also have made some splendid lines out of cotton—"cheap enough to tie dogs up with," as an old friend of mine says, and each one, however, fine and strong enough to "drag a barge," and at Redditch there are also line-makers. Then, again, the American raw silk lines—made of unboiled silk—are remarkable for their cheapness and durability; and some of the foreign exhibitors at the Fisheries' Exhibition showed lines of remarkable strength, if not of superior finish.

My advice to the amateur tackle-maker therefore emphatically is: buy your *undressed* lines from Nottingham or Newark (mention my name if you choose), and dress them yourself. Not because the makers in question cannot make a good dressing, but because a well-dressed line is much more expensive if you desire to *buy* it, and because you can save by doing it at home. Of course, the utility of dressing a line consists in the undoubted fact that it will last

nearly four times as long as one that is undressed, and the convenience for throwing out of a dressed line is far and away greater than in the other. The first of the following recipes is the invention of Dr. Emil Weeger, President of the First Moravian Piscatorial Society, and his description of it, together with some valuable hints on the preserving of lines were published in the *Fishing Gazette* some months ago. With many apologies to my friend, its editor, I condense what is there so ably said. The mixture is simply one of pure resin and solid paraffin, which Mr. King of 1, *New Street*, *Commercial Road*, has very kindly offered to sell pure at low rates, and the Doctor goes on to state, "This mixture gives the lines a pleasant flexibility, united with a certain degree of stiffness or firmness which for most purposes is extremely advantageous, and which can be increased or lessened *ad libitum* by adding more or less of the resin. Twisted fishing lines, cord or whipcord, lose the faculty of kinking, or curling, if dressed with it. The proportion which I have found to answer best is four parts by weight of paraffin, and one part of resin for summer time, and five parts of paraffin and one part of resin for winter time, because in cold weather the dressing is a trifle firmer. Now to dress lines proceed as follows: Take four or five parts of the paraffin, put in an iron pot or vessel and dissolve it over a gentle fire, then take one part of resin, put it in the melted paraffin and stir till the resin is dissolved also. In case some impurities which the resin sometimes contains should be visible on the bottom of the vessel, take another pot and pour the mixture into it, taking care to leave the impurities behind. After a little cooling, the mixture is fit for use if you mean to dress a coloured line—a line made of light green, or tawn, or otherwise coloured silk.

"If you want to dress a white or raw silk line, and you wish to give it colour—perhaps a green or a brown one—take some green or brown paint which you can get at any oilman's, and mix according to your fancy. I like a green colour with a brownish hue, and for that purpose I mix with the dissolved paraffin a compound of one part brown paint and one part green, in the following proportion: To four or five parts paraffin and one part resin, I add the above mentioned finely pulverized paint. Then take your line, be sure that it is perfectly dry and cleansed of all snarls and knots, wind it up on a spool, or if you have none at hand make a coil, immerse it in the liquid and now somewhat cooled dressing, and cover the pot with a wooden lid which has a small hole in the centre, after having run through the hole the top end of the line.

"Then take a piece of wet sponge or wet linen, hold it in one of your hands which is resting on the lid, put the end of the line between the wet linen or sponge, and with the other draw the line not too slowly through it, pressing the line gently, and thus stripping off the superfluous dressing, put the dressed line on the table or on the floor. This latter manipulation can be done much better and with greater comfort by the aid of a fixed cylinder about eight inches in diameter, with a handle, by which you wind the line from the left hand.

"Then when in the short time of a few minutes, the dressing on the line is quite cool and firm, stretch the line well. Keep it tight somehow or other, and give it a polish by rubbing it well with wet linen. Finally, to give the line not only a beautiful enamel-like appearance, but also to make it more smooth, rub it well with finely pulverized venetian talc, or for want of that, with very fine pulverized tufa (pumice) stone, commonly used by the wall-paper makers."

The great merit of this dressing consists in the line becoming almost exempt from "kinking," and I repeat that I deem it *the* best dressing ever invented.

It is possible, however, that this highly polished surface might not be liked by some, and to these then I offer the following recipes:—

1. Equal parts copal varnish and boiled oil (linseed). Soak the line till well soaked, then stretch across a dry room and remove the superfluous dressing with a piece of dry sponge or rag. This takes some time to dry and harden. Some use gold size instead of the varnish; one third of the size to two-thirds of oil.

2. One tablespoonful boiled oil, beeswax and resin, pieces about the size of a walnut, pulverize the resin and cut the wax into thin slices; put them together in a jam pot and this in boiling water till dissolved, mix with a piece of wood, put the line in when the mixture is warm. Hang it up to dry, and clear superfluous dressing from it as indicated in Recipe 1.

3. Boiled linseed oil one pint, beeswax quarter pound, melt in jam pot in boiling water, put line in while mixture is hot. Stretch, clear of superfluous dressing, and dry as before directed.

4. Quarter pint of boiled linseed oil, beeswax as large as a filbert, Burgundy pitch as large as a walnut, rather more than a teaspoonful of copal varnish. Soak in mixture when it is warm, clear, stretch and dry.

5. This is a well recommended dressing. After the line is quite dry from the preceding dressing, take it and immerse in gold size, stretch it swiftly, and cleanse it with rag or sponge, let it draw, dip it again in gold size, and dry it again. When it is thoroughly hard and dry it must be steeped in an india rubber solution which is thus made: Take a flask of salad or olive oil, and shred india rubber white as you can get it, as

finely as possible, and place it in the flask. Put the flask in warm water, and this in the oven, so arranged that it does not quite boil for a week, or until the india rubber is dissolved. Then steep the line in this solution, and having cleaned and stretched it in a dry warm room, let it dry, taking care not to leave it in that position till it is quite hard. This is a complicated recipe and a troublesome one, but I have found the line dressed with it is practically indestructible.

6. Half a gill of oak varnish, one gill of boiled oil. Steep and dry, and then dip again and repeat the cleaning and drying.

7. Half-pint boiled oil, three-quarters wineglassful copal varnish, half wineglassful of gold size.

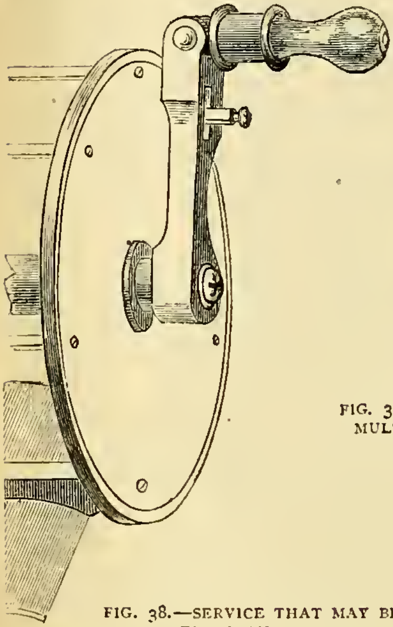


FIG. 38.—SERVICE THAT MAY BE FITTED TO ANY WINCH.

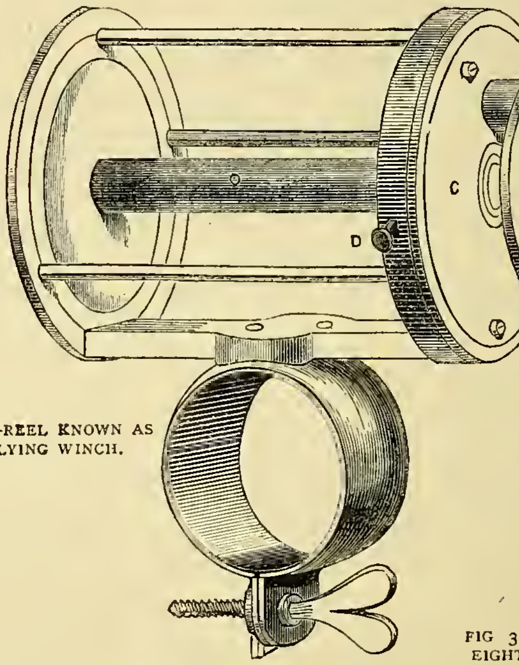


FIG. 37.—REEL KNOWN AS MULTIPLYING WINCH.

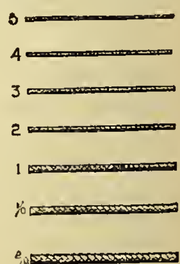


FIG 35.—GAUGES OF BEST EIGHT-PLAIT SILK LINES.

Mix in a jam or gallipot. Let the line stay in the mixture a couple of days, then stretch and dry, and again soak the line in the mixture, stretching and drying as before.

8. White india rubber in chips, two ounces; half-pint spirits of wine. Stretch the line and dry as before.

Fig. 35 indicates the gauges of the best eight plait silk lines made at Redditch (Messrs. Allcock's). It is here given because it gives an exact idea of the sizes in general use.

Reels and their Fittings.—After referring thus fully to lines which are designed to be carried on the reels and winches attached to the rod, it now seems fitting to refer at some length to the reels and rod fittings now in general use. It is just proper to state that reel and winch are not convertible terms; the former referring exclusively to such contrivances for winding in the line are made of substances other than metal, such, for example, as wood, ebonite, vulcanite; etc. The winch, on the other hand; is generally composed of metal. Sometimes a compound winch is put together, such as some of the more expensive salmon reels, but the very price is a prohibitory one to all but those who have more money than they know what to do with.

The reel is seldom made at home; but where the reader is in possession of a good lathe, I really don't see where the great difficulty lies in making it. Fig. 36 shows the kind in common use; it is true its cost (from 3s. to 5s.) does not perhaps justify the time expended and trouble taken by the unskilled amateur, whose tools are perhaps far from suitable, yet it *can* of course be made as I have said, if so desired. A indicates the outer plate, which should be of thoroughly seasoned Honduras mahogany. This and the barrel; B, are usually turned together, as well as a sort of false side which fits into the outer plate, C, and is flush with it on the inner side. Of course, it is understood that this false side is made as thin as it is possible, consistently with strength. These two parts of the reel being manufactured, the brass nut next demands attention. D indicates a brass cross which is carried down and on to a plate at E, where it is riveted. This plate is, of course, intended to be attached either by means of a rivet or by soldering. The nut shown at D terminates a shaft of steel which passes through the

plate, C, through D and A, and in turn terminates in a nut which is detachable for the purpose of clearing any fouling of the line. The handles are, as represented, cone shaped, and either of some hard wood or bone, preferably the latter.

Fig. 37 exhibits another kind of line winder termed a "multiplying" winch. The outer box at C contains two sets of cogs. The outer is large, and the other just the size of the shaft on which the line is intended to be wound. D indicates a little stud, so arranged as to throw the cogs out of gear so far as multiplying is concerned. E is a winch attachment which has found favour in high quarters, because of its easiness of attachment. Of course it has one very good quality, it can be placed on comparatively any rod. There is only one other arrangement in existence which permits of that desideratum, and that I shall presently describe. The advantage of the "multiplier," of course, is that which consists in being able to reel up so quickly in comparison with other styles of reels; and this is no mean benefit when Piscator is doing battle with some gallant six-pound trout or lordly *salmo salar*. At such time every aid is useful.

FIG. 39.—HARDY'S PATENT WINCH FITTINGS.

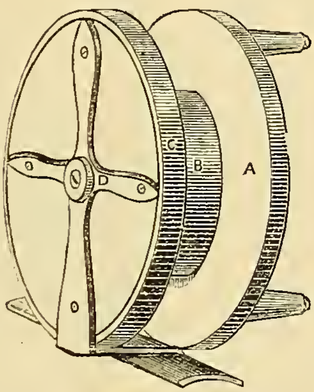


FIG. 36.—SKETCH OF REEL IN COMMON USE.

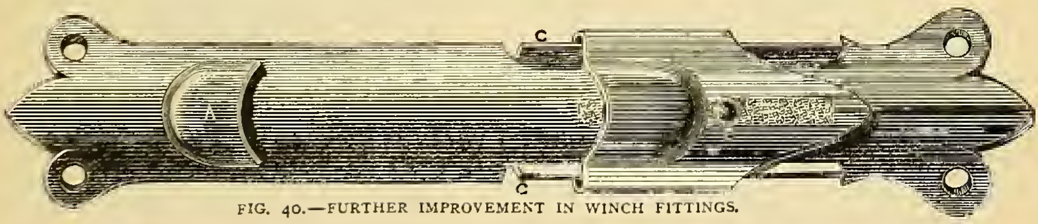


FIG. 40.—FURTHER IMPROVEMENT IN WINCH FITTINGS.

Fig. 38. similarly shows a very useful device which can be fitted to any winch It is a well-known fact amongst sportsmen that nothing is so unfortunate in travelling. The device on the handle of this winch therefore is for the purpose of protecting the otherwise easily broken projection. The drawing exhibits half the reel to save space, and the handle is made to fold down on the pin at A, the head of which works stiffly in the handle. I chiefly refer to this that the reader may be *au fait* of these devices, scarcely with the hope that he will be able to utilize them in his amateur manufacture of tackle.

It is obvious from the foregoing that the plate at E, Fig. 36, is the part intended to be attached to the rod. This attachment was ordinarily by means of two bands of metal placed on the butt of the rod—one fixed the other sliding up and down as occasion required. This was at best but suitable to those reels that fitted, but as makers, owing to the unavoidably different sizes of their reels could not guarantee that without direct reference to the rod—the difficulty was for a long time looked on as insuperable until that shown in Fig. 37 came into vogue. Some two or three years ago Messrs. Hardy Bros., of Alnwick, invented a most ingenious remedy, and it was soon after purchased by Messrs. Allcock, in whose hands it still remains.

In this arrangement, Fig. 39, A, A are the grooves to hold the plate of reel, B is the reel plate stop, C is the locking bolt. The reel plate is simply slid under the grooves A, A towards B, till the bolt C flies up in its place. This bolt C, holds a coiled spring which enables the angler to press it down level with the fitting.

A further improvement has been made, which enables the fitting to take not only a winch of every width in its plate but of any length, of course, within reason. I show this in Fig. 40.

A is a fixed cap to hold one end of reel plate; B is a sliding cap to hold other end of ditto; C C two slides to carry sliding cap. The sliding cap is attached to a spiral spring as indicated, and this of course furnishes the necessary retaining power over the winch or reel plate. I do not think there can be much doubt that these fittings will be those of the near future on all

rods, and it is because of this that I show them. In placing the winch, all one has to do is to pass the plate in at B and force B back sufficiently to allow of the entrance of the other end of the plate at A. The spring aforesaid then comes into action.

The necessary ferrules, rings, and other attachments for rods may be considered as part and parcel of the rod itself, and as such will receive attention when I come to consider the latter in a separate important chapter on Rods and Rod-making. The above are adjuncts which cannot be considered as absolutely necessary to the rod *per se*, though, of course, highly desirable.

A TELEPHONE CARBON TRANSMITTER.

By GEORGE EDWINSON.

A SECTIONAL drawing of this instrument is given at Fig. 1, and in this all its parts are clearly shown. It will be seen that it is constructed of wood and is similar in form and size to that of a desk ink bottle. The casing is composed of two parts, the base and the cover, with its mouth-piece; these parts should be turned out of wood to the size and form shown in sketch. The wood employed for this purpose may be pear wood, cocus, walnut, or a bit of close-grained sound, well-seasoned yellow deal. In the centre of the base, on the upper side, turn a smooth cavity $\frac{1}{4}$ inch in depth and $1\frac{1}{2}$ inches in diameter, to receive the carbon disc and the powdered carbon. On the under side of the cover hollow out a resonance chamber $\frac{1}{8}$ inch in depth and $2\frac{1}{8}$ inches in diameter in the widest part, but falling away at the sides to 2 inches at the bottom, as shown in Fig. 1. The mouthpiece is a funnel-shaped hole through the cover nto the resonance chamber, and should be $1\frac{1}{4}$ inches in diameter on the outside, falling away to $\frac{1}{2}$ inch where it enters the chamber. The cover is secured to the base by three $\frac{5}{8}$ inch thin wood screws, two of which are shown in position.

Now for the fittings. Procure a slice of best hard gas retort carbon, and reduce it to a disc $\frac{1}{8}$ inch thick and $1\frac{1}{2}$ inches in diameter, by filing it with an old rasp file and finishing it off with a finer file. Cut a notch on one side, as shown at Fig. 2, and copper-plate the edge of the opposite side by hanging it in an electrotyping copper sulphate solution exposed to the current of a small battery cell for one hour, or hang it for the same time to the copper of a Daniell cell, then rinse it well in water, dry it, tin the copper with a hot soldering iron and solder to it the end of a short length of No. 26 silk-covered copper wire, as shown in sketch. This wire will pass through a small hole made in the base of the instrument, and will connect the carbon disc with the negative binding screw. Pass the wire through this hole and draw it into its position whilst the carbon disc is being gently pressed into its place at the bottom of the cavity in the base. Next procure a thin slice of best white pine with a smooth tough grain, and thin it down to a mere shaving, and from this cut a disc $2\frac{3}{8}$ inches in diameter to form the diaphragm of the transmitter. This diaphragm must be uniformly thin and flexible throughout, and is made $\frac{1}{8}$ in. larger all around than the extreme diameter of the resonance chamber, this surplus is nipped between the edge of the cover and that of the base, and serves to keep the diaphragm in position. To the underside of this diaphragm must now be glued a square of thin carbon plate as shown in Fig. 3. This carbon plate should be $\frac{1}{16}$ inch thick and $\frac{3}{4}$ inch square. Before it is attached to the diaphragm one of its corners should be copper plated, tinned, and have a short length of

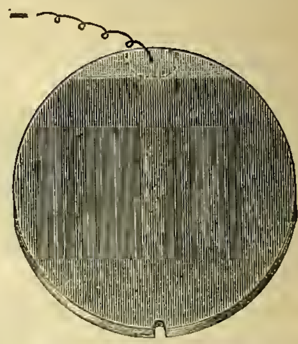


FIG. 2.—LOWER CARBON DISC, SHOWING HOW TO ATTACH WIRE.

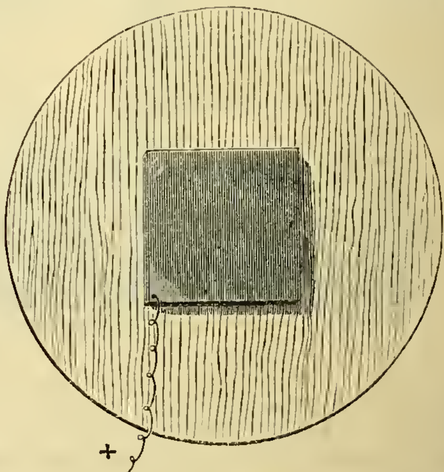


FIG. 3.—PINE DIAPHRAGM, SHOWING CARBON PLATE AND HOW TO ATTACH WIRE.

No. 26 silk-covered copper wire soldered to the corner to connect it with the positive (+) binding screw. Make a hole with a fine bradawl through the base of the instrument, and let it enter the carbon cavity by the notch made for it in the lower carbon plate, then pass the wire through this hole to the back of the instrument, as shown in Fig. 1, but do not pull it tight

when the diaphragm is in its place, for a little slack wire must be left in the cavity to allow the diaphragm being lifted without breaking the wire. When the diaphragm is in its place there should be $\frac{1}{16}$ inch space between the upper carbon square and the lower carbon disc, and this space must be three-quarters filled with powdered carbon rendered fine enough to pass through a sieve containing forty meshes to the inch, but not fine enough to pass through one with fifty meshes to the inch. The size of the carbon particles is most important, since the performance of the instrument depends largely on this and on the quantity of carbon powder put into the cavity. The actual best quantity must be determined by trial, but it will be

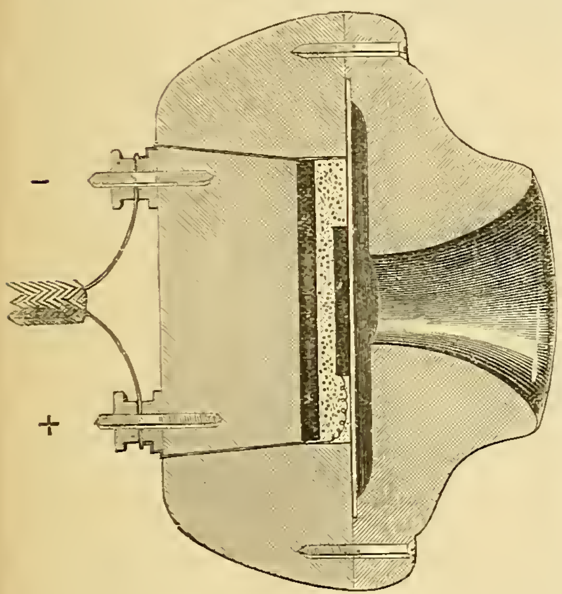


FIG. I.—TELEPHONE CARBON TRANSMITTER IN SECTION. FULL SIZE.

found to be nearly that mentioned above. In making the trials it will of course be necessary to frequently unscrew the cover, and here some care must be exercised in lifting the diaphragm to avoid injuring the connecting wire. It will be seen that the wires from the two carbon plates are carried through the base of the instrument and secured around the tangs of two small brass binding screws inserted into the back of the base. From these the line wires proceed to the negative and positive poles of the battery as indicated by the mark + for positive (carbon, copper, silver, or platinum) pole of the battery, and — for negative or zinc pole of the battery. Lest readers should be puzzled over this last statement and deem it a mistake, I will here explain that the current in a battery proceeds from zinc to copper, etc., and from this element around the external circuit back to zinc again, and in this way the copper becomes the positive or giving out *pole* of the battery, and the zinc the negative or receiving *pole* of the same. I have shown the line wires proceeding from the end of a piece of cord as usually employed for telephonic communication, bu it is not necessary to adopt this plan, for any two insulated wires will serve the purpose. If a flexible connecting cord be used, the back of the instrument with its screws may be enclosed in a cover turned to fit the screws, and having a hole in the centre for the cord.

Now respecting the battery power required to work such a transmitter. This may, and indeed should be a mere toy of a battery, for a very faint current will be proved best in practice. Strong currents give rise to a variety of interruptive noises in the receiver, which have been characterised by the various expressive terms of grating, hissing, sputtering, frying, etc. These are mostly caused by violent make and break contacts of the carbons, and the consequent formation of minute arcs and vibrations among the particles. When using the telephones on a short circuit of small resistance, as in experiments for amusement alone, such a small battery as can be formed by rolling up a small piece of thin sheet zinc in blotting paper, dipping this in weak muriatic acid, and inserting it in a silver thimble. If the battery cannot be modified and the circuit is not long enough to offer sufficient resistance, this must be increased by putting in long coils of thin wire and thus checking back part of the current. Perhaps some time may be spent in adjusting all parts until they work in unison, but by these means alone success will be ultimately attained.

The last few words of this article must be in the form of a caution to readers determined to make and use a carbon transmitter for their own use and amusement. The gentleman who has so kindly placed the foregoing information in my hands to be used for AMATEUR WORK, is an electrician of some repute, and well versed in the new patent laws. He says that "all the good forms of transmitters are patented, and any person making one, even as a toy, would be breaking the law." That is to say, the laws protecting a patent are so stringent, and the specifications are so cunningly made up, as to make it possible for a jealous, greedy telephone company to spy out an imitation of the patents owned by them in the instrument just described, and to take action against an amateur making one for his own amusement. As powerful companies have shown a high-handed Shylock tendency to exact strained justice on puny offenders, amateurs must be on guard, and quietly enjoy the fruits of their labours in toy telephones, strictly avoiding the use of them for business purposes, and refusing to sell them to any person.

PRACTICAL SCENE-PAINTING FOR AMATEURS.

By HENRY L. BENWELL.

II.—PAPER SCENERY.

I WISH to mention here, before proceeding further, a species of stage decoration, recently introduced and designed specially for the use of amateurs, and known by the name of "Paper Scenery." Having, however, no relation whatever to the painting of scenes, I feel it my duty, before describing it, to give a few explanations and reasons for introducing it to the notice of my readers. Firstly, then, because I have long thought there will sure to be some who read these pages, and who, after carefully studying the instructions for painting a scene from beginning to end, will, at the finish of their task, find themselves as far off from being able to put a brush to the canvas as they were before perusing the chapters devoted to each department. I hear the reader ask, Why is this? —at least, I fancy I do; and I reply, simply because all those who may be so situated know nothing whatever of either drawing, painting, or perspective; and without a little knowledge of these subjects no one could paint a scene, *but anyone can make the paper scenery* I am now speaking of. I do not, however, hint for a minute that every reader of this journal is not an artist; on the other hand, looking at its pages from month to month, as I have done from its very commencement, I am convinced that many subscribers and contributors possess a large amount of artistic ability, and know more, no doubt, of drawing and water-colour painting than the writer of these pages, who, after all, knows but little of the fine arts beyond scene-painting requirements. It must, therefore, be understood that I am not writing a treatise on the rudiments of drawing or perspective as a prelude to scene-painting, so my advice to all those who wish to gain a little practical knowledge in these arts is to obtain a few of those excellent shilling manuals published by Messrs. Rowney and Messrs. Newton, which, if carefully studied together with plenty of painstaking practice, will soon enable them to pick up the art of painting in distemper, as given in these pages. But to return to my subject. My second reason for mentioning the paper scenes is to make these papers of some use to those who are unable to use the brush, as well as those who know how to paint; therefore I hope the former section of my readers will find plenty of amusement in the making of paper scenery, should they ever have occasion to manufacture any. Thirdly, should anyone be in immediate want of a little scenery, and do not know how to proceed as regards painting it, the paper scenery will come in handy until these papers are sufficently advanced to enable them to undertake the painting of scenery on canvas. The paper scenery can also claim these advantages: it is clean, light, and very portable, and requires but little skill and labour in making and fixing it. These are my reasons for noticing it here. I will now proceed to give a full description of it.

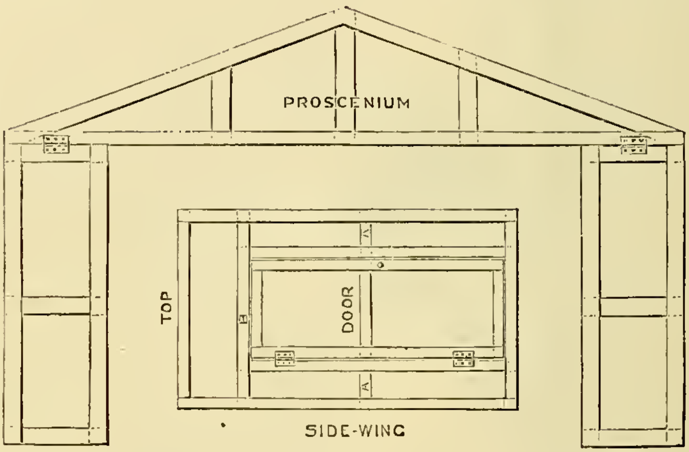


FIG. 5.—WOOD FRAMEWORK FOR PAPER SCENERY. DOTTED LINES SHOW MORTISES.

Manufacture of Paper Scenery.—This particular class of scenery is the invention or idea of Mr. S. French, 89, *Strand W.C.*, who has designed it with a view to obviate the great difficulty experienced by amateurs (particularly in the country) in obtaining scenery to fix in a drawing-room, and then only by a considerable outlay for hire and great damage being caused to walls, etc. The scenes are published, coloured, on strong paper, and which are joined together by pasting the whole of the sheets on some ordinary unbleached calico or scene canvas. The following four scenes each consist of thirty sheets of paper, and can be made suitable for almost any piece:

Garden Scene.—Fig. 3 is an illustration of this scene. It is kept in two sizes. The small size would extend to 15 feet wide by 8 feet high, and the large size 20 feet wide by 12 feet high. The scenes can easily be made higher by pasting some blue paper at the top of canvas to represent sky.

Wood.—This is similar in style to the above, only a wood scene is introduced in the centre. It can be made higher by pasting some sheets of foliage at the

top. It is kept in two sizes, as the previous scene. Prices of the garden and wood scenes, each: Small size, 30s.; large size, 40s.; one pair of wings only. Extra wings may be had if required, 7s. 6d. and 10s. per pair.

Foliage.—Sheets of paper on which foliage is drawn, which can be repeated or cut to any shape desired. Price: small sheets, 30 × 20, 1s. per sheet; large size, 40 × 30, 1s. 6d. Blue paper, for skies, 2d. per sheet.

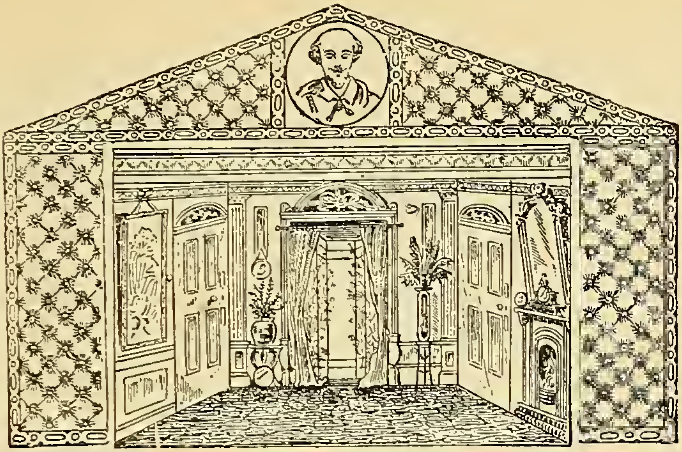
R  L

FIG. 4.—PROSCENIUM, WITH VIEW OF DRAWING ROOM SCENE SET.
R, L, Right and Left Side of Stage.

Drawing Room.—This scene is only kept in the large size, namely, 20 feet by 12 feet, but if made as a box scene it would not require a very large stage, as it would then run up each side and make an enclosed chamber. In the centre of this scene is a French window leading down to the ground, which can be made practicable, if required. On the left wing is a fireplace, with a mirror above, and on the right is an oil-painting. If a box scene is required extra wings may be had, consisting of doors each side, which can be made practicable. If a scene of this description be used, all the framework must be made after the manner of the side-wing in Fig. 5. It will be seen that the framework for a door is made separate from the rest of the screen, and it must be hinged on before the canvas is covered over the framework.

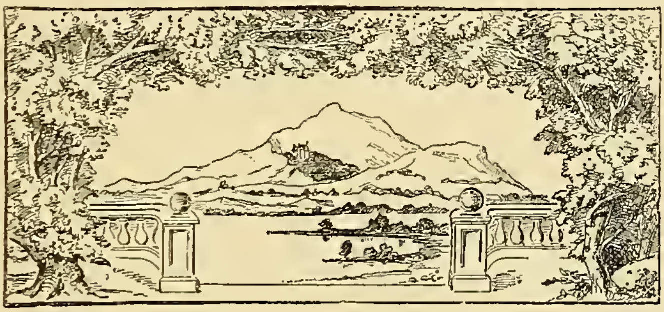


FIG. 3.—GARDEN SCENE IN PAPER SCENERY.

This is put on the outside framework first, using plenty of tacks and stretching very tight. The door is then covered in the same way. If a practicable fireplace is required, an opening must be left in a wing as high as the cross-piece A, the width being the same as the doors; the top cross-piece is also done away with. Plain frames are made with one cross-piece across the centre in order to add to the strength.

Cottage Interior.—This is also only kept in the large size, but, of course, it can be reduced to fit any sized room. In the centre is a door leading outside; on the left centre is a rustic fireplace, and on the right centre is a window. A box scene can be made of this by purchasing extra wings, as before described, and forming doors on each side. In Fig. 6 is given a side view of the stage, with the cottage scene set ready. If a box scene be not used for the drawing-room or cottage interior, I should advise the use of at least three pairs of sidewings, and the same number of top borders. Fig. 6 also shows how to fix the little woodwork that is required to hold the proscenium and carry the scenes; it also gives a view of the back of proscenium. The top side-battens, however, should be made to come flush with the front up-

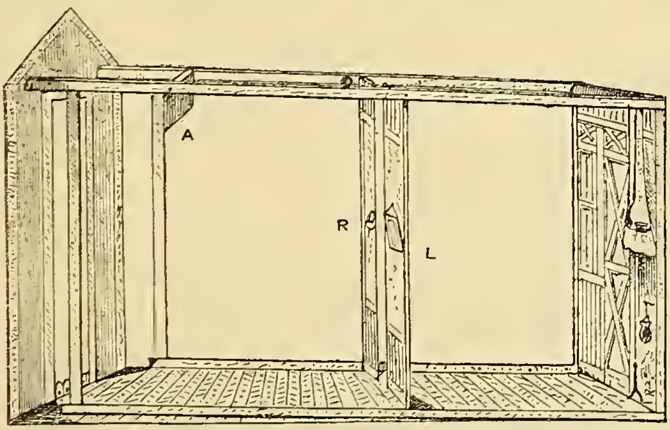


FIG. 6.—PERSPECTIVE SIDE VIEW OF STAGE WITH COTTAGE INTERIOR SET.
A, Border on Batten. R, L, Right and Left Side of Stage.

rights, and not as shown in the engraving ; it will then be easy to fix the proscenium to these uprights, either with cord or with screws from the front. Price of drawing-room and cottage scenes, 40s. each ; extra wings, 10s. per pair.

Proscenium.—This is shown in Fig. 4, with the drawing-room utilised as a box scene, and set ready for use. The method of making the proscenium framework is shown in Fig. 5. When all is completed it should have the appearance of light blue puffed satin panels, set in a gold border, with the Shakespeare medallion in centre. An ordinary pair of damask curtains would do duty as an act drop, which should be made to open from the centre, the curtain rings running on an iron rod fixed to the side battens. Price : puffed satin paper, 20 inches by 30 inches, 1s. per sheet ; gold bordering, 1s. per sheet ; sufficient to do 14 feet. Shakespeare medallion, 18 inches in diameter, 2s.

Doors.—These comprise three sheets of paper each, and are used in the box scenes before described. They can be had for either drawing-room or cottage purposes. Price : 7 feet by 3 feet, 5s. each.

Window.—This is a parlour window formed with two sheets of paper, and if required practicable can be made to slide up and down. To do this, it would be necessary to have the sheets pasted on two pieces of wood or cardboard, and a groove made on the side edges of the upper half, so that the lower may slide into it. The introduction of curtains each side add to the effect. Price : 3 feet by 4½ feet, 4s. each.

Fireplace.—This is also made with two sheets of paper. It will be found most useful in many farces where a character has to climb up a chimney, and also in plays where a fireplace is indispensable. To make it practicable, the sheets must be pasted on wood or pasteboard, as above, and the inner part cut out and placed a short distance back resting on a chair. The actor is then enabled to get under the framework of the fireplace and step on to the chair, giving him the appearance of ascending the chimney. Price : 3 feet by 4 feet, 5s. each.

Anyone possessed of a couple of doors, a window and a fireplace, together with a few rolls of paper from the nearest paper-hanger's, has all he requires for making a parlour scene, thus adding another to the list already named; it may also be given the appearance of a drawing-room, library, or morning-room scene by exercising taste in obtaining the different wall-papers. It is a good idea to mount the side-wings on rollers, and have a subject each side, a ring in the top roller should be firmly fixed *exactly in the centre* for hanging the scenes on hooks screwed into the top battens. To save material and space, the back scenes may also be pasted on the canvas both sides or back to back, but in this case they must be upside down to each other—that is to say, the sky on one side corresponds with the fore-ground on the other side. The back scenes are then easily changed, it is only necessary for two persons to unhook the top roller and lower it to the ground and hang the bottom one up, when the scene is immediately changed. This is very handy in a cramped space, and it also saves time and a lot of trouble. The whole of the scenery when not in use can be rolled up and packed away in a very small space. I have now shown to what purposes the paper scenery may be put, and also how it may be improved upon, and I trust my remarks may be of use to at least a few who make amateur theatricals a hobby. Any further information I shall be glad to supply at all times. (*To be continued.*)

NOTES ON NOVELTIES.

By THE EDITOR.

10. WALKER'S "BRICKWORK." 11. CALVERT'S MECHANICS' ALMANACK. 12. "FABLES AND FANCIES," &c.

I HAVE a subject that is interesting to a great number of amateurs to speak about to my readers, but as I have not yet been able to gather all the information I require respecting it, I must leave it for the next Part.

10. *Walker's "Brickwork."*—This is a recent addition to the valuable works included in Weale's Series, published by Messrs. Crosby Lockwood and Co., *Stationers' Hall Court, E.C.* It is a practical treatise, embodying the general and higher principles of Bricklaying, Cutting, and Setting, with the application of Geometry to Roof Tiling, remarks on the different kinds of Pointing, a description of the materials used by the bricklayer, and a series of problems in applied geometry, useful to all who are engaged in this trade. The book is by Mr. F. Walker, and has ninety-one cuts and diagrams. The price is 1s. 6d.

11. *Calvert's Mechanics' Almanack and Workshop Companion for* 1885.—This is a useful year-book—which has reached the twelfth year of its age—published at 4d., by Mr. John Heywood, 11, *Paternoster Buildings*, and *Manchester*, and by the Compiler, Mr. John Calvert (Calvert's Patent Agency), 99, *Great Jackson Street, Manchester.* Every page is full of useful and interesting information.

12. Mr. Henry Vickers, of 317, *Strand*, tells me that Nos. 1 to 4 of the first series of coloured sheets of sketches, entitled "*Fables and Fancies,*" are now ready. These sheets are humorous and interesting, and especially adapted for children. Nos. 5 and 6 will be ready soon to complete first series ; Six Nos. forming a series will appear quarterly. Designs by first class artists. The price is 2d. per sheet. The January Number of "*The Journal of Decorative Art,*" price 1s., will be an extra special one, and will contain a double paged Coloured Plate, 18 in. by 13 in., showing decoration for Dining Room Door, a design for Ceiling Decorations, and two full-sized Working Drawings of Dado and Frieze, 80 in. by 30 in.

AMATEURS IN COUNCIL.

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine, the information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

Mitring Board for Frame Making.

NEPENTHE writes:—"I have been so pleased with the working of a new 'wrinkle' in Frame Making, suggested by your own plan of a mitring board (Fig. 471, page 434, of 'Every Man His Own Mechanic'), that I venture to think you would like to place it before your readers. Your drawing was as in Fig. 1, representing two boards of equal dimensions screwed together as a shooting-board, with strong pieces, C, C, firmly fastened to the upper board as shown. I added the strip, D, D, with a saw-cut exactly in line with the mitre cut in the pieces, C, C. This ensures an exact angle of 45°, which a narrow slot, like E F, will not. I then filed off the projecting ends of a Booth Bros. corner clamp, and drilled the plate for two screws, filing off also the handle of the screw so that it may clear the bottom board while being turned up; and after cutting out an exact bed for each screw frame, let one into its bed, flush with the surface of the upper

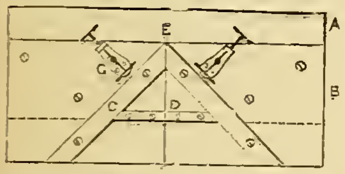


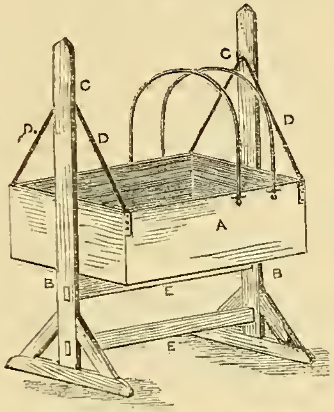
FIG. 1.—MITRING BOARD WITH CRAMPS.

FIG. 2.—SIDE ELEVATION OF MITRING BOARD.

board, on each side of the mitre, C, C, so that the frame pieces might be firmly clamped to the mitre box while being glued and bradded. By removing one or both clamps, G, G, the joints may be first trued with a smoothing plane turned on its side, as was intended in your own plan. I give a side elevation of the mitring board in Fig. 2."

Child's Swinging Cradle or Cot.

JACK.—There is no difficulty in arranging a Child's Swinging Cradle or Cot, for its construction is very simple. It consists of two parts—namely, the cot itself and the frame on which it is suspended. The cot is, and need be, nothing more than, a rectangular box, as shown at A in the annexed diagram. This may be an actual box, having the sides, the head, and the foot of wood, with laths screwed on to the edges of the sides in notches cut for their reception to form the bottom. The sides should be padded along the upper part, at least, with cotton wool, so that the child's head and hands may never come in contact with anything hard. As an alternative mode of construction, for lightness' sake, you may make your sides, head, and foot of frames covered externally with ticking or cretonne, neatly tacked on, to form soft yielding panels; the bottom should be made of laths, as before stated. The frame to support the cot may be made as shown at B, B. It consists of two wide uprights mortised into feet, and strengthened by struts. At C, C

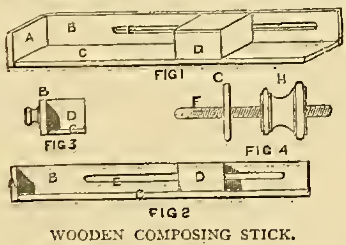


CHILD'S SWINGING CRADLE OR COT.

are two strong iron hooks, on which move the iron straps, D, D, which are screwed to the ends of the sides of the cot. The straps are screwed on, and the cot is then suspended on the hooks. Any smith will make them for you. If you require a canopy, two or three osiers bent in a semicircular form, and attached to the sides by thrusting the ends into metal loops screwed on for their reception, will serve as a framework, to be covered with cretonne. The frame should be strengthened by two longitudinal bars running from head to foot, as shown at E, E. I have only explained the principle on which a swing-cot may be made, as you ask for something that an amateur joiner can manage to make. A very elegant article of furniture may be made by forming the sides, head, and foot of fretwork panels, and turning or carving the frame.

Wooden Composing Stick.

D. B. A. (*Finsbury*) writes:—"The following description of a composing stick will enable anyone to make one of these indispensable adjuncts to a printing press with very little trouble, and to those who, like myself, prefer to use as far as possible home made appliances it will be useful. I find



WOODEN COMPOSING STICK.

Fig. 1.—Perspective View. Fig. 2.—Front Elevation. Fig. 3.—End View. Fig. 4.—Screw for Fixing Block D.

mine answer every purpose as well as those sold, usually I believe, if not always, of iron. The measurements I give are those of one I have in use, but there is no reason why they need be adhered to, as requirements may vary. The great thing is to have the work true, and few amateurs who have done any woodwork can fail in this respect if a little care be used. Mine is made of ¾ inch mahogany, but any sound dry wood will do. The piece C is 7 inches long by 1 inch wide, made perfectly true at back and end nearest A. B is a piece the same length, but only ⅞ inch wide. This, after the slot E is cut, is screwed on behind C. The end A is then screwed on to both B and C. D is a movable block for setting the length of line. In the back of it a hole is bored to take a screw. The one I have used is a terminal screw out of an electric bell. Into this the part F is fixed, G being countersunk flush with the block. The remaining portion of the screw is passed through the slot E when the H will screw the block firm for any length of line required. An ordinary round-head wood screw could be used instead, or a flat-head one if the slot were bevelled at the back to fit it, but a screwdriver would have to be used each time the length required altering. The block in this case ought to be of some hard wood."

The "Toggle"—What it is.

C. B.—A "Toggle" is simply an elbow joint, and consists always of two levers or members, which may be of equal or unequal lengths. These links or levers are connected in such a way that they can be bent so as to

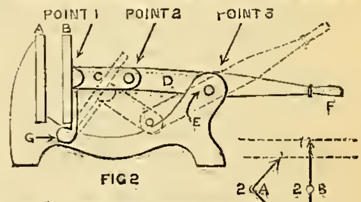


FIG. 1.—DIAGRAM SHOWING ACTION OF TOGGLE. FIG. 2.—APPLICATION OF ACTION TO PRINTING PRESS.

bring their points, 1, 2, 3, into a straight line, as in B, Fig. 1, or so that lines drawn through all their joints would form a triangle, as in A, Fig. 1. The power to straighten A into the position B may be produced by applying a lever acting horizontally on 2, A, Fig. 1, or either of the levers, 2, 1, or 2, 3, may be prolonged past the pivot, 1, 3, and power applied in a circular path to bring all the points into a straight line. The Simplex and the Model are examples of this latter class. Fig. 2 shows the application of the diagrams A, B, Fig. 1. The type bed, A, is confronted by the platen, B. A lug on the back of the platen forms the pivot 1 of the arrangement. A pivot in the frame at E answers to the point 3. The prolongation of the handle, F, past 3, is simply the means of straightening the "Toggle." Point 2 of the diagram is midway between C, D, and 1, 2, 3, are all in a straight line in Fig. 2, and the platen is making an *impression* as heavy as the frame can withstand. When the lever, F, is raised into the dotted position, the points, 1, 2, 3, form a triangle and decrease the distance between 1 and 3, see horizontal dotted lines, Fig. 1, and the dotted lines of Fig. 2. If the hinge, G, is slotted, it will certainly prevent the "clam-shell" action, but the remedy will

be worse than the disease, for then the platen will have to find its own level on the face of the type, and will produce a smear, in printing technically called a "slur."—PRACTICAL PRINTER.

Organ Building.

AMICUS.—The kegellade windchest is certainly only adapted for an organ with few stops as a separate chest and action is required for each stop. If anything went wrong of course you would have to lift out the chest in which the fault was located. With regard to my suggestion as to reversing the action, I may point out that as the pallets would be extremely small and the springs light, the touch would probably not be heavier than with weighted pallets or valves which are pushed up. You say that you propose to place an extra stop at the back of an ordinary swell box, on a separate windchest of the kegellade pattern, only retaining the channels and substituting the push for the pull action, using a flat weighted pallet. Pardon me if I remark that if you retain the channels it will not be a "kegellade," but an ordinary soundboard for a single stop. But the term is no matter. "What's in a name?" The action may be as you suggest, viz., by a sticker rising from each key-tail, acting on a splayed backfall, or, if your swell already possesses a sticker action, all that will be needed will be a little block on each sticker to lift the end of the splayed backfall. You will see this idea sketched out in page 492, Vol. III., in answer to AMATEUR ORGAN BUILDER's question with regard to a coupler action. The wind pressure in the windchest will not, I think, affect your weighted pallets in the way you suggest; indeed, I am of opinion that it would be more likely to press them down. With respect to your remaining difficulty I will endeavour to solve it, if you will kindly furnish me with a sketch of the bellows and cuckoo feeder, giving all dimensions, size and number of valves, amount of weighting, and the wind pressure in inches.—M. W.

J. Y. (*Glasgow*).—There is really no practical necessity for having a complete roller board action to the keys in a small chamber organ. If, however, your soundboard is already set out for the purpose of placing the pipes in an alternate order, and you have not sufficient height for your roller board—which you say is 31 inches wide—I would suggest that you should endeavour to arrange it so that the rollers work in the same manner as described for the pedal roller boards in pages 486 to 490 and 530 and 531, Vol. II. The sketches which accompany those instructions—especially those in page 533—will give you every information as to the manner of obtaining either pull or push actions in any direction. This plan converts the roller board into what is termed a "roller frame," which lies flat instead of standing on edge, consequently you only need a few inches above the keyboard, instead of nearly three feet for the working of the squares and rollers, and your organ will therefore only require a height of about 8 feet 6 inches.—M. W.

A SUBSCRIBER TO VOLS I. AND II.—I am afraid J. B. (*Tyldesley*), has found that his plan of getting the 8 feet CC tone from a pipe about 2 feet 6 inches long and 3 inches square has proved a failure, hence his silence. For a small organ, intended simply to accompany the voice, you might make one with a soundboard about 3 feet long and 8 or 9 inches wide, and place on it a single stop of pipes, running from CC to F, fifty-four notes, making the lowest octave or so of stopt pipes, the longest one of which would be about 4 feet long. The largest pipes might be planted off on the floor or on a separate soundboard placed at the back of the instrument as low down as may be required in order to reduce the height. If this were adopted the soundboards need only be as long as the keyboard (about 2 feet 8 inches for full-sized keys). The scale adopted for the pipes may be the same as that given for the requisite stops in the second series of articles, whichever stop you may select. If you carried your pipes to Tenor C only, and made the lowest octave of stopt pipes, your longest pipe would be only 2 feet speaking length. I shall probably give instructions for miniature organs in future papers.—M. W.

H. S. (*Salford.*)—The back parts of AMATEUR WORK, are always kept in print, as frequently advertised in the Monthly Advertising Sheets, issued with the Magazine. The chapter containing instructions for paper pipe making is in Part XII., and those on voicing in Parts XXVII. and XXVIII.

Organ Building—Estimates Wanted.

H. TIMS wants estimates for the construction of Organ Pipes according to specification, No. 2, Vol. II., page 21, including the violoncello and gemshorn described. Pipes to be voiced and tuned.

Surface-Plates.

A. F. S. (*Dresden*).—Does A. F. S. *really* give me credit for having meant that glass could be *scraped*. If so, then I am sorry that I was not a little more explicit. But had I been so, he would have been deprived of the weak quibble with which he prefaces his remarks. I have never ground, much less "tried" to grind plates "8 inches square," or any other size, true. Neither will anyone else, I hope, especially with the assistance of but one other plate. I must compliment A. F. S. on his "accomplishing" it, and especially so with "little difficulty." But I should like very much to know by what means he *assured* himself of the *truth* of the job when "accomplished." Listen! O ye humble amateurs. A. F. S. ascendeth, and speaketh from a vague upper level of "things" that in your "lower air" ye wot not of. Wonderful to be told! He carrieth a mighty secret in the depths of his inner consciousness, a secret that, unbosomed, would, I fear me, peril the reputation of Whitworth himself. The early teaching of the engineer warned him that surface-plates were to be held in the highest veneration. Handled gently. Cared for tenderly. Abused! never. Nothing to be left undone. No precaution neglected whereby the life of the plate might be shortened. Every care to be taken to maintain its truth. Bah! What's the use? Where's the necessity? Under the new *regime* of A. F. S. apparently as he would have it, none. This is the "*new*" *regime*. You grind up your plate "true." Good. Then you deliberately grind it untrue. That is bad, but we are prepared for this. The remedy is very easy, very. You must *grind* again for more truth. All grind, you see. Always searching for truth; now a little off one, then a trifle off the other. A sort of profit and loss, minus profit—a Peter and Paul ledger account. Grinding is tedious you say. So it is. How shall we lighten it? *Eureka!* Get the secret accelerating "gadget." Clap it on, and presto! Sixty-four renovated square inches per hour guaranteed. But these are heights unto which we cannot hope to attain. The "secret" dieth with its progenitor, and I trust will be buried near that wicked "factory" (?) wherein surface-plates are plentiful and anvils scarce.—OLLA PODRIDA.

Action of Trigger in Air Gun.

W. L. (*Lisnaskea*).—You say you do not understand the action of the trigger valve in the air gun "which releases a *little* of the compressed air at each shot." In the stock of the ordinary air-gun is a condensing syringe. The action of the piston of the syringe condenses the air into a cavity which has a valve opening inwards (that is to say towards the cavity) just behind the bullet. The barrel is open and the bullet is inserted in the usual way, the gun being a muzzle loader. The pressure of the finger on the trigger opens the valve just behind the bullet, which is ejected from the gun with great force owing to the rush and sudden expansion of a portion of the condensed air in the cavity. As soon as the pressure of the finger is withdrawn the valve is immediately closed by the pressure of the air which remains in the cavity. At every successive discharge the condensed air in the cavity gets slightly expanded, until at last it is so weakened that a fresh supply by means of the condensing syringe is required. This is the principle of the construction and action of the air gun. The larger the capacity of the receiver, the greater the quantity of air that can be compressed and stored in it. You must suit the size of the receiver to the size of the weapon you are going to try to make, and its general construction as well. No regulation for capacity can be laid down beyond the broad law just stated.

The "Combination" Saw Stand.

GRAHAM writes, in reply to OLLA PODRIDA's queries in page 592, Vol. III.:—"(1.) The intersection of two lines drawn by means of a centre square as guide, will give the centre of a regularly formed circular casting. I regret to have made my meaning hidden to OLLA PODRIDA. (2.) Either three or four arcs would be sufficient, but six makes the liability to error rather less. (3.) Referring to some standard works on turning I find that Knight, Lukin and Northcott all recommend that for true holes they should be drilled half from each end with a smaller drill than the hole required, and either the full-sized drill or a broach sent through from one end afterwards. My impression is that Holtzapffel recommends the same. (4.) The reason that one side should be faced at a time is, that the hole being bored true to one fac

and both faces being required true to the hole, it is better work to put the collar on an arbor to true the second face, both then will be true with the hole. The hermaphrodite applied to such a hole is absurd nonsense."

Casket in Fretwork.

D. W. W. (*Camberwell*), writes:—"I herewith send you photos of an article in fretwork, a recreation I have been induced to follow through reading AMATEUR WORK. This article, which, for want of a better name, I term a Fretwork Casket, is made of white holly backed with gilded cedar, the various parts are fixed together with cement and gilded screws, the whole, as you will observe from the mounted photo, being fixed to a stand of the same shape as the casket and covered with crimson plush. While writing on this subject, I should like to inform your readers where to obtain some really good designs for fret-cutting, which are by a long way the best I have seen, although I have large bundles of designs bought of every publisher or agent whose advertisement I have noticed. The designs to which I refer are published in Germany, and sold by Mr. H. Zilles, 14, *South Street, Finsbury*, whose advertisement appeared in the October part of AMATEUR WORK. Not only are they vastly superior in design and printing, but the prices charged are much lower; for instance, a sheet of six beautiful photo frames cost 3d. only, these frames could not be purchased singly for less than 4d. if of English or American origin, and similar size. I make comparison of size only, for with the exception of Messrs. Booth Brothers, of *Dublin*, I have never seen anything to approach them in quality. Among several other pretty and simple novelties in the German designs are the letters of the alphabet arranged as photo frames. I enclose you a sheet of these." [The piece of work you have succeeded in making is very beautiful—judging from the photos sent—which give a very good idea of the casket, although they are not first class as photos. I agree with you as to the excellence of the designs supplied by Mr. Zilles, to which I had the pleasure of calling attention in page 41 of this Volume.—ED.]

Lathe Circular Saws.

M. A. writes:—"I recently fitted up a circular saw on my small lathe, and was sadly disappointed to find it lacking in driving power for any stuff over about ½ inch. At last it occurred to me that my face-plate, which weighs between four and five pounds might help me. I had a hole drilled in the middle of it and a centre fitted, using a carrier with bent stem which caught in one of the slots of the face-plate. The additional weight of the heavy plate revolving has nearly doubled the capacity of my saw."

"Sale, Exchange and Purchase" Department.

T. L. L.—I am obliged to you for your suggestion but I cannot adopt it. The announcements in the above-named department of this Magazine are now made under numbers simply, and the mode of correspondence to be observed is indicated in the Rules that serve as a heading. It is left to the option of readers whether or not they will enter into correspondence with the advertisers; and when the distance is great it is always possible to give and take a little in the matter of carriage, so as to adjust matters to the mutual satisfaction of buyer and seller. Nothing is charged for the notices, and the cost of correspondence especially by post card, is little enough in the present day, so if the negociations that have been commenced come to nothing I do not think much harm is done to either party in the way of either "mutual disappointment" and "useless labour." There are far worse things happen at sea, as the saying goes.

Le Page's Carriage Glue.

W. S. (*Whitchurch*).—If you refer to page 182, Vol. III. of this Magazine, you will find that it has been plainly stated that Le Page's Carriage Glue, which is manufactured by the Russia Cement Company, of *Gloucester, Massachusetts, U.S.A.*, is supplied by the Company's Agent, M. Theodor Eckhardt, 3, *Crown Court, Milton Street, London, E.C.*, in tins, ½ pint, 1s. 6d.; 1 pint, 2s. 9d.; 1 quart, 4s. 6d.

Battery for Electric Clock.

M. C. (*à Condé, France*).—Kindly allow me to compliment you on your excellent English letter. It was not at all necessary to attempt a depreciation of its value by asking me to excuse its "broken English," for the English composition of the letter was much superior to that of many letters received by me from English correspondents. I could desire that I might be able to write as good a letter in French as you write in English. I am sorry to hear that you have no such periodicals in France as AMATEUR WORK; but am glad to know that you appreciate our English journal. I shall always be pleased to render every assistance to French amateurs who can *read* AMATEUR WORK, and you may tell them from me that I shall be glad to receive their communications, although they may be only able to express their ideas in French or in broken English. Your letter was received by me at a date too late for a reply in the November part, but I will try to answer it now. There has not yet been invented for driving electric clocks a battery superior to those in which the principles discovered by Professor Daniell are put into practice. Modifications of the form of cell devised by him, such as Calland, Minotto, Gravity, and Meidenger cells are very plentiful, but all batteries in which zinc forms the positive element immersed in a solution of sulphuric acid, opposed to a negative element of copper in a solution of sulphate of copper, may be classed as Daniell batteries, and are subject to the same laws which govern those batteries. To get the best work from those batteries during the greatest length of time, we should obey the following rules: 1. Always arrange the resistance of the outer circuit, to slightly exceed the internal resistance of the battery. 2. Always keep the sulphate of copper solution as near saturation as possible, and arrange the work of the battery to use up the copper salt at the same rate as it is dissolved. 3. Use porous cells of fine grain and best quality, and soak the tops and bottoms of the cells in melted paraffin wax before using them. 4. Well clean and amalgamate with mercury the surfaces of the zinc elements before using them, and work them with a half-saturated solution of zinc sulphate. The reasons are as follows: 1. If a Daniell cell is placed on a circuit of low resistance, copper is deposited too fast, and with hydrogen on the negative pole, the copper solution becomes exhausted, and violent action on the zinc throws off its coat of mercury. 2. If the copper solution is not kept up to saturation point, the internal resistance of the battery is increased; whilst if the copper dissolves too fast, it will force its way into the zinc compartment, and polarize the battery. 3. This will surely happen if porous cells of coarse open grain are used; and if the pores are not filled with paraffin down to below the water line, those pores will be filled with crystals of copper sulphate, and in this way creep into the compartment with the zinc. If copper gets by any means into the zinc compartment it becomes reduced on the zinc, and polarizes the battery. 4. When zinc sulphate is used instead of sulphuric acid, the action is less violent at first and more constant, and a coat of mercury prevents pitting of the zincs. Now as to the best form. I think that the Meidenger cell is the best for your purpose. It is made up thus: A glass outer cell in which a zinc cylinder is immersed in a solution of zinc sulphate; the zinc element has a ribbon of copper riveted to it, and this is coated with paraffin. A porous inner cell well paraffined, containing a cylinder of thin sheet copper immersed in a saturated solution of copper sulphate; this is kept up to saturation point by a constant supply from a flask containing crystals of the copper salt. This flask (an Italian oil flask) has its mouth stoppered with a cork perforated to admit a capillary glass tube; this tube and the neck of the flask is immersed in the solution of sulphate of copper in the porous cell, and keeps this saturated because the glass tube draws water up into the flask and dissolves the crystals as required. A ribbon of copper must pass to the outside from the cylinder, and this must be coated with paraffin. The neck of the flask should also be greased to prevent copper salts from creeping upon it. Respecting your other questions, I should advise you to try the bobbins wound with finer wire as you propose. I shall be pleased to have a description of your clock, and also of your electric bell alarum; or, better still, send the descriptions to our Editor for insertion in "Amateurs in Council." I regard the small dynamo machine recently described as a mere toy for amateurs; a small Gramme or new pattern De Meritens is far preferable for real work.—G. E.

Substitute for Overhead Motion for Lathe.

A. F. S. (*Dresden*) writes:—"In the article with the above title, in Vol. III., page 180, the writer gives a plan of screw cutting with band gearing. It is just what I require. I have made additions by which I can cut a much greater number of threads.

I can also adjust with the cross slide without slackening the cord. If any reader would care to know more on the subject, I shall be happy to give the information he may reqnire.

Alexander Adjustable Jointer Gauge.

C. B. (*Tunbridge*), writes:—"I take the liberty of enclosing a sketch of the Alexander Jointer Gauge which Messrs. Churchill & Co. procured for me, and can recommend the same to the notice of amateur carpenters, who may, like myself, have experienced some difficulty in shooting up boards for jointing. The gauge is adjustable at any angle, aud can be nsed for chamfering. The price is 6s. 9d." [I am obliged to you for the sketch. Messrs. Churchill & Co. inform me that they do not keep this gauge in stock, but will do so if a demand springs up for it. The patentees claim for this tool as its special advantages: — First, The ease with which it is attached to any plane, jack or jointer. Second, The great amount of time saved, without the use of bcvel or try square. Thirdly, Is adjnstable for squaring, or to any bevel desired. Fourth, The work completed in the highest state of perfection, even by inexperienced workmen. It is nsed as follows: Attach the gange to the plane so that the depression in the centre of the wing of the gauge shall be directly opposite the cntting edge of the plane iron.]

Preserving Skins.

J. J. W. (*Burford*) wishes for a cheap and easy way of preserving small skins. Let him stretch them, fur downwards, on boards, and secure with tacks. The preservative powders given in our articlo are the best dressing; but as something simpler seems to be desired, let him use burnt alum, with the addition of a little camphor or pepper (these latter to make the skin more obnoxious to insects). If alum is not to hand, wood ashes may serve as a substitute. The skins should be rubhed daily for the first three or fonr days, and will be cured in a fortnight or three weeks. Either of these methods will leave the skin somewhat rigid, bnt a way of rendering it pliable again has been alrcady given in "Amateurs in Council."—G. W.

Bichromate Battery.

A. B. (*Coutham*).—The wires connecting the cells of the battery are fastened to the binding screws on *the tops of the cells*. Unscrew the nut on the binding-screw (telegraph pattern), twist the wire round the screw, and screw the nut home. For intensity connect carbon of one cell to zinc of next carbon of this cell to zinc of following one, and so on, the remaining two screws serving to conuect with apparatus.—Lebasi.

American Clamps.

J. B. (*Stonham*).—The statement to which you refer in "Every Man His Own Mechanic," in page 128, with reference to Americau Clamps was perfectly correct at the time the book was written, which was about six years ago, bnt since that time Messrs. Churchill and Co. have, perhaps, ceased to keep them on sale, as they are not now inoluded in their present catalogue. If you *write* to Messrs. Churchill and Co., 21, *Cross Street, Finsbury, London, E.C.*, and point ont the description of clamp you want, and where you obtained your information respecting it, they will doubtless get yon as many as you require. Your London friend must have been misunderstood by the person to whom he spoke when he called on your behalf, for Messrs. Churchill and Co. still have various kinds of clamps in stock, and very good ones too.

Clock Repairing.

Olla Podrida writes, in reply to A. H.:—"Let me thank you for your courteous reply to my qnestion. Yon have stated the case clearly. I fear, however, that it would be rather difficult a task for an amateur to undertake; that is why I recommended the purchase of new wheel and pallets. It would, nevertheless, be, as yon justly remark, a good source wherefrom experience would be gained without regret at possible failure."

India Rubber Bands for Gearing Slide-Rests to Mandrel.

Olla Podrida thns commeuts upon the remarks of A. F. S. (*Dresden*), *in re* above: —"Until I read the letter of A. F. S., I never credited anyone with the belief that rubber bands could be employed in screw-cutting. But I mnst conclude that A. F. S. is of that opinion, an opinion which, as a matter of course, nothing that I cau bring forward will cause him to alter. Still, to show him that others are of the same mind as J. L., let me state that for reasons which should be evident, even to the veriest tyro, rubber bands are *entirely* unsuitable. I do not advocate the use of bands in any form for screw-cutting; I prefer the sure and certain method, although fully aware that very good work may be done with gut bands, if, as J. L. implies, it is properly treated before using. The swivelling arrangement of the *top* slide in rests so fitted, *very rarely* allows it to turn right round. As to the relative merits of home and foreign work in machines, foreign makers have yet to alter considerably before they arrive at the solidity which characterizes English work. I know of cases where English machines have been purchased by foreign makers and copied with microscopic accuracy, bnt that is not foreign *design*, it is only copy.

INFORMATION SUPPLIED.

Organ Keys, Their Price, Etc.

W. H. V. (*Stratford*) writes in answer to W. W. (*Norwich*):—"Keyboards can be purchased of Messrs. Shenstone and Co., *Grange Road, Leyton, Essex*. I got minc there made to order; the price was £2 in celluloid, and 50s. for ivory. I chose the former, and am perfectly satisfied with them, as I have had them in use for nine months. I had great touble to find a mannfacturer till I saw their advertisement in the 'Piano Dealer's Guide.'"

F. W. L. (*Walsall*) has sent a letter that may be usefnl to W. W. (*Norwich*), and if the latter will send the Editor a stamped envelope with his address on it, it shall he forwarded to him.

A. J. (*Clapham*) writes in reply to W. W. (*Norwich*) that Mr. H. Brooks, *Lyme Street, Camden Town*, is an excellent maker of Organ Keys. The price would depend on the length of keys and the material used, as pine or lime, and whether celluloid or ivory was used, the former being the cheaper. A set, say 24 inches long, in pine and ivory, would cost about £2.

Gravity Cells for Electric Bell.

Casenhem says, in answer to Matthew Stickleback, page 47:—That gravity cells can be used for electric bells, but not of the type used by the Indian telegraphs, as these cells have too high an *internal resistance* for ordinary electric bells. If he will give particulars of his bells, *i.e.*, resistance of the coils (if he has the means of getting it), or size of wire and bobbins, then he will gladly put him on the track to make a good gravity battery.

Lebasi writes in reply to Matthew Sticklesack:—"I don't know why they should not be used for hells A friend of mine had one in use without any attention for about eighteen months. It was constructed by placing a sheet of copper in the bottom of a jar, aud filliug up with saw-dust, and placing a sheet of zinc on top of the saw-dust. Wires were connected to zinc and copper, the one from the copper being encased iu indiarubber tubing to prevent it touching the copper, and a saturated solution of copper sulphate poured on the saw-dust completed the whole thing. It was not *exactly* a gravity battery in the strict sense of the word."

Nepenthe writes:—"Matthew Stickleback asks if the Calland 'Gravity' Cell can be used for electric bells? I may answer that for several years I had a battery of sixty cells (quarts) iu my house, which was set up for medical purposes, and 'coupled for iutensity,' not 'qnantity.' Four of the cells rang my office-door bell, my servants' office bell, my stable call, and a foot bell under dining table. I think they need less attention thau any other cells, *provided* they are not set up in a damp place. When it is difficult to keep the zinc from evaporating, and encrusting the sides of cell and shelf on which it rests, it is advised to coat the jars inside, an inch deep from margin, with white paint or paraffin varnish, or, better still, to have each jar covered with tightly fitted deal, top perforated for conductors."

Articles for Glass Bottles.

J. W. S. (*Alston*).—In reply to A Lame Miller of Norwich, as to how certian articles are got into glass bottles, I will try to explain to him how I pnt the articles mentioned by him in them. He must not suppose that they are put in before the bottle is made, as some people seem to think. I had one a while ago, bnt gave it away to some friends, who exhibited it at the Shildon Industrial Exhibition. I never saw anyone putting them together, but I guessed they were pnt in at the neck, and so started and put one up in the following manner. I got some pieces of soft white wood and plaued so that they would go nicely into the bottle neck, and fit them all up together before putting in the bottle to see if every piece fit right. I had to guess the inside of the bottle by measuring the outside, and calculating for the thickness of glass, but these are better in being rather loose, for the defect is remedied when you

put the water in; put the cross-pieces in the bottom first, then put the ladder in, then the battle-axes, then the centre post to be put down into a gimlet hole in the centre of the bottom cross-pieces, bored before putting inside; and, lastly, what I consider the most difficult, putting the top cross-piece in on account of nearly all the spare room in the bottle being taken up. I put everything in with a piece of strong wire hooked at the end, except the battle-axes, which I put in with a pair of ladies' old dress suspenders, or a pair of long pincers would do, providing they would go in the bottle neck and would reach to the bottom. The centre post and top cross-piece must be previously coated with red varnish, because when the water is put in, it stands on the varnish in minute drops, and sparkles like diamonds in a light. He must not lose patience if the pieces of wood tumble to the bottom of the bottle now and again. He ought to hold the bottle in one hand, and the wire in another, so that the pieces will almost fall in their places. I must not forget to tell him that the water is further used to keep the parts better together. It swells the wood, and makes loose joints tight; it also magnifies the wood, so that they actually appear to be a greater diameter than the bottle neck, and also the bottles are generally put on the mantel-shelf, so that if the water was not in, the wood would contract and fall to pieces. Anything further will be answered through "Amateurs in Council," or I will make him one for a trifle.

Casenhem replies to A Lame Miller of Norwich:—"The following very amusing inexpensive experiment perhaps is a solution of the problem: Cut out a cross, etc., in thin zinc, and suspend by means of a thread in a bottle, so that the articles do not touch each other. Now fill the bottle with a strong solution of acetate of lead. If a liquid of 20 grains of nitrate of silver to I ounce of distilled water, and 1 dram of mercury is used, the articles have a bright silvery appearance."

A. C. writes in reply to Lame Miller (*Norwich*) page 47, Vol. IV.—"The cross, ladder, etc., in the bottle are made to just pass through neck of bottle, then fit easy together in the position they are to be when inside, and less in breadth than inside diameter of bottle. With wire pincers or pointed stocking needle put each one in separate. With a little scheming and patience he would succeed in making one. The water is put in to tighten the parts together, and it also makes them look twice the size they are."

Black Varnish for Telescope Tubes.

Casenhem writes in reply to H. M. H.:—"Dissolve ½ ounce of orange shellac in spirits of wine or methylated spirits, half a pint, put in a warm place to dissolve. Add ivory or lampblack till the desired deadness is produced by trial on a piece of brass. Strain through a piece of muslin. Warm the tube, and lay the lacquer thinly on with a camel-hair brush. Another method which I have used, lampblack mixed with gold size to a paste with a knife, then thin with turps. If bright, deaden with more black."

Waterproofing Textile Materials.

Casenhem writes in reply to Scotchee, page 47:—"Grind to a powder separately ½ lb. of alum, ½ lb. of sugar of lead, then mix in an earthenware vessel with 1 quart of boiling water, allow to cool for a day. Rub on to the cloth with a sponge till saturated. Iron over it and hang to dry."

Chemicus writes in reply to Scotchee:—"Cooley's Process, which waterproofs, but is not airproof, is as follows: Spread the material on a smooth surface, wrong side up, rub it over with pure beeswax free from grease, until an even but thin coat is applied, then pass a hot iron over it, and brush whilst still warm. Wearing apparel thus treated is waterproof, and has the advantage of not being impervious to air—the great drawback of ordinary mackintoshes and other waterproof articles."

Joining Tortoiseshell.

Casenhem writes in answer to L. S. D., page 47:—"Try isinglass, 1 part, white glue, 2 parts, dissolved in 30 parts of hot water, and then evaporated to 6 parts. This he has found good for cementing ivory," etc.

J. R. B. (*Thanet*) writing in reply to L. S. D. (*Jamaica*) hopes that blame will not be imputed to him if the following should fail, as he has not tried it. Procure a pair of tongs long enough beyond the rivet to take in the full width of the work. Make an accurately-fitting lap-joint to the two pieces of shell. See that the joint is quite free from grease. Wet the joint with water, and holding the pieces together, draw the tongs—*hot*—across the joint, following the hot tongs with water.

Cement for Waterproof Sheets.

Casenhem replies to Loco, page 47:—"Try (1) ½ lb. of common glue boiled in 1 quart of old milk. (2) Bisulphate of carbon, 4 ozs., indiarubber cut up in thin shreds, 1 oz., isinglass, 2 drachms, and ½ oz. of gutta percha. When dissolved, coat the surfaces to be united, and allow to dry, then heat the parts to melting point, press or hammer together to drive out air bubbles. (3) Dissolve I oz. of gutta percha in 6 ozs. of bisulphide of carbon, use same as No. 2. (4) To 1 oz. of indiarubber shreds add 2 ozs. of benzine, which will if well shaken turn to the consistency of honey with a sediment at bottom, if not well dissolved add more benzine. Three coats are ample for uniting. Nos. 2, 3, 4 keep in well stoppered bottles to prevent evaporating. No. 3 I have found very good."

Paper Roofing Material.

Chemicus writes in reply to Frank St. Clair:—"The Willesden paper you mention has many advantages, among which are strength and flexibility. It is not so liable to crack while placing in position as asphalte. It is made by soaking thick paper until thoroughly saturated in cupro-ammonium, and is the invention of Dr. Scoffern. The cupro-ammonium is made by standing slips of copper in an open vessel nearly filled with strong liquid ammonia, and leaving it exposed to air. Care must be taken to place it in a well-ventilated place, and where the choking fumes cannot be inhaled. It is left exposed, I believe, until of a blue colour. Paper soaked in this, when dried, will be impervious to water. I may mention that a great many of the buildings at the 'Fisheries' last year were roofed with this material."

Saltpetre in Walls.

J. R. B. (*Thanet*) writes in reply to Matthew Stickleback:—"Probably the mortar and plaster are mixed with sea-sand. Stone lime mortar containing pit-sand, or finely-sifted coke-breeze would, I should say, be the best to use, though the old bricks may be the cause of the fault. Alum would rather aggravate the evil than remedy it."

L. Speth writes in reply to Matthew Stickleback, who wishes to know how to treat his walls:—"I will briefly state how I treated mine. Very defective they were, with large discoloured patches, staining the paper as fast as I put it on, in the effort to repair them. Being determined to go to the root of the matter, I took off all the paper, and thoroughly cleansed the walls with hot water, soap and water, and then with cold water, finally scrubbing them down with pumice-stone. The worst place was over the chimney-piece; whether from smoky bricks, bad mortar, or damp, I cannot exactly say—it might be all three. Then I cut out the old plaster, and filled in with new plaster of Paris, whiting, and size, rubbing it smooth with pumice-stone. I then obtained a can of Thompson's Damp Wall Paint, and put on three coats of it; after which I gave the walls another wash down with cold water, and let them dry with open door and window for two or three weeks, taking care, however, to keep both door and window shut in damp or misty weather. A day or two before papering I put on the size with a piece of sponge. A pound of size to a pint of water, warmed together, *not boiled*. The paste was *very well* boiled, and to an ordinary washing basin of paste a penny lump of alum was added, broken down small, and boiled with it. It was capital paste, and worked very smooth, and stuck very tight. The alum purifies it, but I never heard it had any effect on discoloured walls. For that give me the damp wall paint; cheap, easily put on, and, as far as I have gone, effectual. I have put one coat (all I had left) on a very *damp* cupboard; it has quite removed the mouldy smell it had formerly. In the spring I propose to put on more paint, and make a good cupboard of it, and treat some more of the old walls in the manner described above. I ought to add that the room has been done this year, and is never without a good fire; still, all the patches that were doctored with the paint are so hard and dry, I feel pretty sure that all will be right. Another writer alludes to the Willesden paper: this is most interesting, as it opens up, as I believe, a wide field for making all sorts of things at a small cost. I propose to begin with a washing tub, but not caring to have too many irons in the fire at once, I have not procured any yet, but am only gathering all the information I can upon the subject. I should have tried it for my room if the paint had appeared a failure. I learnt how to do the walls by questioning practical workmen. It was a good deal of trouble, but I am repaid fifty-fold by the result."

INFORMATION SOUGHT.

Clock Case for Dial.

T. B. T. (*Carnew*), asks:—Can any reader of AMATEUR WORK kindly supply the design of clock case with glass in front? The dial of clock is square with a curved piece on top, in fact the same in shape as the dial of an ordinary Dutch clock; also, how to make a compensated pendulum for clock which has a dead beat escapement, and state weight of pendulum bob, and also of weights, and say where the materials can be had, and price?

Wooden Foot-Bridge.

J. C. (*Ireland*) wishes to make a wooden foot-bridge across a river which is 60 feet wide. The general depth of water is 1 foot 6 inches, but in wet weather it often rises to 6 or 7 feet, and the water is then very rapid. The bed of the river is clay, without stones. He asks for a drawing with instructions for making the bridge. [You should have given height of banks on either side above the general depth, and the nature of the banks, and have said whether or not the water overflows the banks when it rises to the utmost height named, and if so, how far the overflow extends.—ED.]

Cheap Works on Steam Engine.

A. W. W. (*Upper Clapton*) wishes for titles and cost of some cheap and popular works containing illustrations and descriptions of Trevithick's Engine "Puffing Billy," the "Royal George," and the Marquis of Worcester's Engine.

Electrical Music Printing.

J. T. (*Exeter*) asks:—Can anyone give me directions for making a small machine for the above purpose, viz.: Recording on paper all the notes struck—say in an octave—the piano being properly connected with the apparatus; or what is about the price of a new or secondhand one?

Design for Hanging Cupboard.

F. H. (*Clifton*) asks for drawings to scale for a hanging cupboard, the cupboard itself to be about 2 feet by 1 foot, with double doors and sides extended to form corner shelves, with an extra shelf above the cupboard shelf, and the top of the sides ornamented by a neat design for fretwork. The back part of the extended sides would look well if formed of a carved panel in a mitred frame. [You will find a design for a cupboard of this description in Vol. III., page 414, and this you could easily modify to suit your wishes.]

Water Glass, Where to Buy it.

C. T. S. (*à Tiheu, Le Portal, France*) asks:—Can any contributor inform me where I can procure water glass (silicate of potash) cheap, as I want a quantity of it to paint some wooden partitions I have just put up. I believe it will render the work non-inflammable in some measure.

Orchestral Piano.

PARSON wants description of mechanism of orchestral piano, or failing that, of piano organ, so common in towns.

Glass-Staining.

PARSON wishes for name of publisher and price of a good work for amateur glass stainers.

Springs for Mattresses, Chairs, etc.

SAILOR asks:—Will any of your readers inform me where I can buy such springs as are used in French mattresses and spring-seated chairs. If they are made in different sizes, in what quantities they are sold, and at about what price?

SALE, PURCHASE, OR EXCHANGE.

Persons availing themselves of this Department of AMATEUR WORK *are requested to note that—*

(1) *No Trade Advertisements can be inserted in this Department, which is open to bonâ fide Amateurs only. The Editor reserves the right of refusing to insert any notice.*

(2) *No charge will be made for the insertion of notices until their number be such as to render it absolutely necessary to do so.*

(3) *Persons writing in reply must forward application under cover to the Editor, in an envelope sealed down, with a Penny Stamp attached in the upper right hand corner, and the* NUMBER *of the notice in the lower left hand corner thus:—*

STAMP here.

NO. OF NOTICE here.

(4) *Letters thus marked and enclosed under cover to the Editor will be forwarded immediately to owners of articles for Sale or Exchange, or persons wishing to purchase. No attention will be paid to any communications in which these Rules are not strictly observed.*

210. **Two Organ Keyboards.**—Great and Swell. Great keys, 26 in. long, Swell keys, 20 in.; in good mahogany frames, fitted with coupler attachment (Great to Swell), complete. Price 35s.

211. **Pair of Double Action Oscillating Cylinders.**—½ in. bore, 1¼ in. stroke, with pivots, steam block, etc., accurately finished. Price 10s. 6d., cost 15s. Also, forged iron turned crank to fit. 3s. 6d.

212. **Microscope,** good as new, 3 powers, stage forceps, condenser, Coddington field lens, etc., in mahogany cabinet, with lock and key. Cost over £3 10s. Will exchange for—(1) Set of good Needle Telegraph Instruments and Batteries, Post Office pattern; (2) Set of Cumberland Bagpipes, in good order; or (3) Good pair of Telephones, with Microphone Transmitters and Batteries. Last preferred.

213. **"Every Man his Own Mechanic."**—Clean and good, bound in Publisher's cover. Price 4s. Purchaser to pay carriage, or Parcel postage, 9d.

214. **Gold Albert, Locket, and Seal,** massive, cost £6 6s., in exchange for a whole or ¼-plate Instantgraph Photographic Apparatus, which must be complete and perfect.

215. **"Amateur Work,"** Vol. I., unbound, clean and as good as new, offered for—(1) Bookbinder's Press and Plough, or (2) Mould for Typefounding and Fount of Type.

216. **Musical Cabinetto,** Whight's, with one roll of music, new. Cost price, £6 6s.; will sell for £4. Any one can play this.

217. **Fifty-two inch Rudge Bicycle,** half bright, ball bearings to both wheels. Price to immediate purchaser, £6 6s.

218. **Photographic Camera,** ½-plate, by Horne and Thornthwaite, stand, baths, printing frame, 1 doz. plates, developing and fixing solutions, offered in exchange for good Cornet.

219. **Air Pistol and Revolver.**—Air Pistol, Pope's patent, nickel plated, nearly new, complete in box, with darts, slugs, gunstock, etc. Price 15s. Six-chambered Revolver, nickel plated, with cartridges. Price 7s. 6d. Or will exchange the two for Lathe and Fret Saw.

220. **Model Horizontal Steam Engine.**—Cylinder 1¼ in. bore, 2½ in. stroke, with governor, link reversing gear, and force pumps for filling boiler, iron flywheel, and bed-plate on mahogany stand. Price 45s.

221. **"Amateur Work."**—Parts I. to XXXV., inclusive, perfect and clean. Will take 9s. 6d., and pay carriage.

222. **"Amateur Work."**—Parts I. to XXXV., inclusive. Will take 10s., purchaser to pay carriage.

223. **Cramer's Piano-Harp or Steel Piano.**—One of these instruments, in good condition, wanted. Will buy for cash or exchange.

224. **Norwich Canaries.**—Will sell for cash; or exchange some for Vols. I. and II., AMATEUR WORK, clean and in good condition.

225. **"Amateur Work."**—Wanted, Parts VII.–XXI., inclusive, in good condition, and all plates, etc., complete. Price to be under 5s.

226. **Sewing Machine Stand.**—Two for sale, with flywheel, etc., in good condition. Price 8s. each.

227. **Kilting Machine.**—Will make fourteen different sized pleats. Worked by gas or oil. Cost £5 5s., will take 15s.

228. **Three Oil Paintings.**—Original, each 8 in. by 6 in., on canvas. Subjects, Cornish Rocks, Old Mill, and Country Farmstead. Value 20s. Will exchange for Banjo, Guitar, Violin, Telescope, Carpenter's Tools, or Conjuring Tricks.

229. **Colleotion of Butterflies and Moths,** British, including "Camberwell Beauty," and other scarce kinds. Would suit beginner. Cash only, 6s., particulars free.

230. **Chambers' Journal.**—8 vols., 1861 to 1869, omitting 1866, unbound. Will receive offers for exchange.

231. **"Amateur Work"**—Vols. I., II., and III., in Parts. Complete, perfectly clean, 14s.

232. **Nautilus Canoe.**—Fitted with heavy centre board, two sails, paddle, rudder with foot steering gear, two watertight compartments, locker, flap, side decks. Nearly new. All offers answered.

233. **One-Manual Organ.**—Six Stops: 1, Open Diapason, 2, Stopped Diapason, 3, Dulciana, 4, Principal, 5, Flute, 6, Fifteenth. Bellows and all fittings complete. Case with good front. Price £5. Carriage paid for 100 miles.

234. **"English Mechanic,"** for last 6 years. Unbound. 10s. for the lot, or 2s. 6d. per single volume.

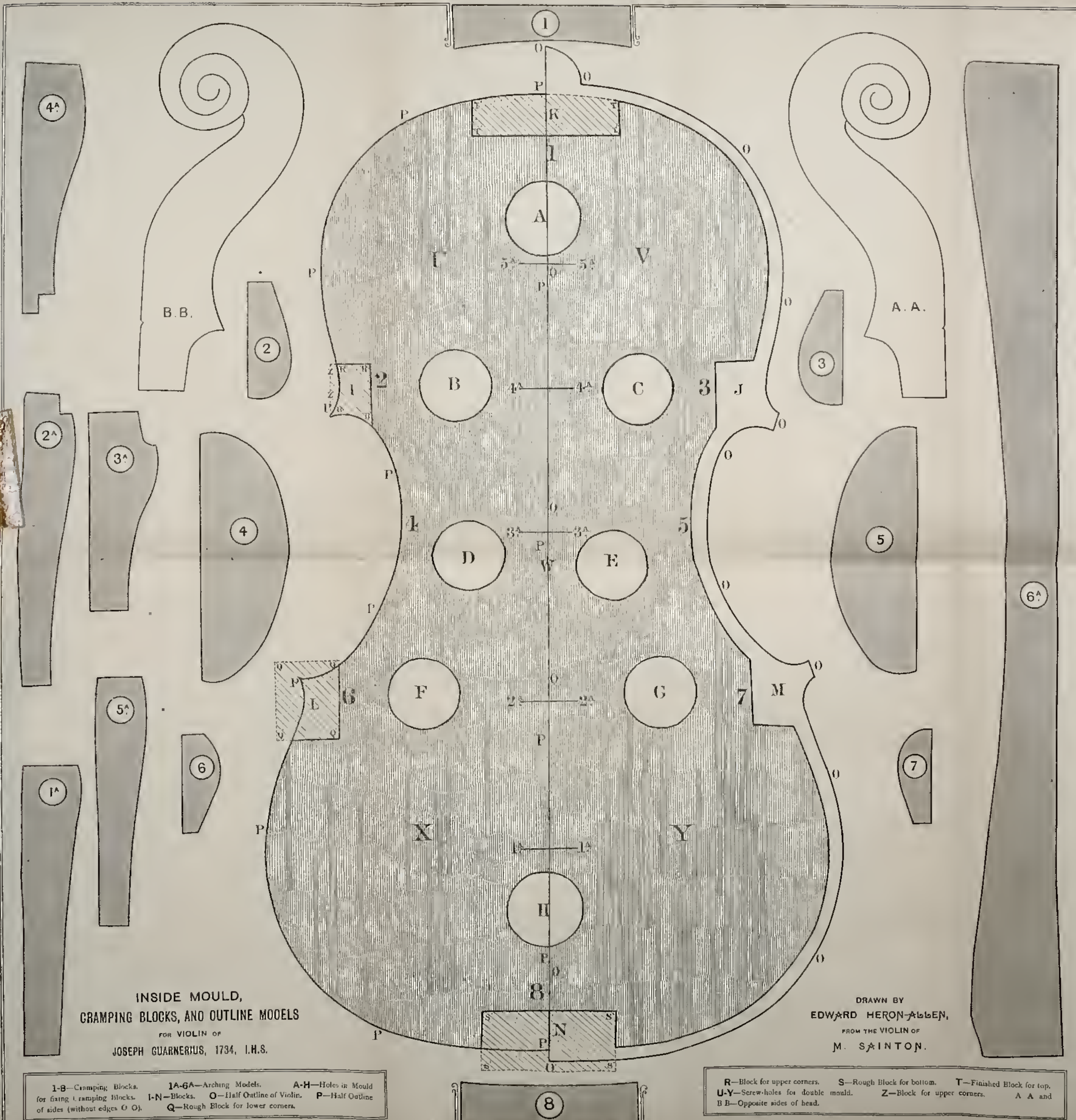
235. **Fretwork Patterns.**—Good, a large quantity offered in exchange for others, or for Back Parts of AMATEUR WORK.

*** List closed Dec. 3, 1884. Notices received after this date will appear in Part 39.

COMMUNICATIONS AWAITING REPLY

I. N., H. G. (*Darwen*), A. W. W. (*Upper Clapton*), T. B. T. (*Carnew*), GALLIA, YOUNG AMATEUR, FENMAN, H. S., ANTON, GETTING GREY ON THE TOP, A. L., TELEGRAPH, MAGNET, E. W. H., CHEMICUS, G. K., S. F. C. (*Liverpool*), T. C. (*Aldershot*), J. T. (*Newcastle*), T. G. C. (*Aldershot*), OPHICLEIDE, BURCOME, FESTINA LENTE, F. H. (*Clifton*), R. A. P., NOVUM SARUM, J. T. (*Exeter*), SAVOIR FAIRE, SIGMA, H. J. (*Lisbon*), C., J. P., F. A. E. (*Newtown Butler*), S. M. L. (*Goderich, Canada*), VETO, J. W. T. (*Kingston-on-Thames*), AJAL PHYSETER, J. B. (*Stonham*), OLLA PODRIDA, CASENHEM, A. B. C., A SUBSCRIBER FROM THE FIRST, AMICUS, ROSELLA, OLD WATTY, A BUTCHER, ASBESTOS, CLERGYMAN (*Burton Fleming, Hunmanby*), BALBUS, G. E. H. (*Forest Gate*), TREMOLO, W. C. (*Greenock*), IOTA, CLERICUS, EDWARDUS, TWIST DRILL, R. L. J. (*Horsington*), T. J. O'C. (*Manchester*), R. W. J. (*Horncastle*), MODEL, H. W. T.

List closed Dec. 10, 1884.



INSIDE MOULD,
CRAMPING BLOCKS, AND OUTLINE MODELS
FOR VIOLIN OF
JOSEPH GUARNERIUS, 1734, I.H.S.

DRAWN BY
EDWARD HERON-ALLEN,
FROM THE VIOLIN OF
M. SAINTON.

1-8—Cramping Blocks. **1A-6A**—Arching Models. **A-H**—Holes in Mould for fixing Cramping Blocks. **I-N**—Blocks. **O**—Half Outline of Violin. **P**—Half Outline of sides (without edges O O). **Q**—Rough Block for lower corners.

R—Block for upper corners. **S**—Rough Block for bottom. **T**—Finished Block for top. **U-Y**—Screw-holes for double mould. **Z**—Block for upper corners. A A and B B—Opposite sides of head.

WARD, LOCK, & CO., WARWICK HOUSE, SALISBURY SQUARE, LONDON, E.C.

THE PRIMITIVE LATHE.

By "AN OLD BOY."

"The child is the father of the man."

IN reading over last year's volume of AMATEUR WORK, I notice that there is a great deal of turning (lathe turning) required in most of the designs given. Now, as I presume there is a great number of amateurs who can neither afford to buy a lathe nor pay for the use of one, I would wish to bring to their notice a lathe capable of turning out very fair work indeed, which they can make for themselves in an hour or two, at the cost of a few pence.

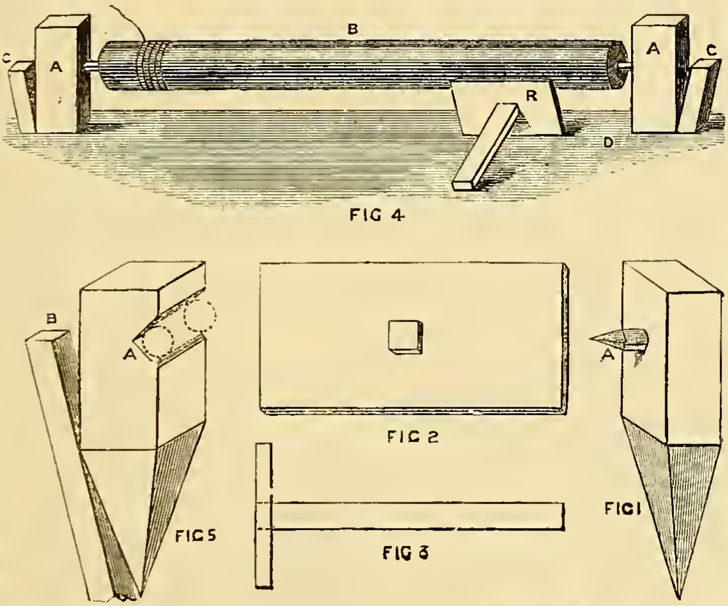


FIG. 1.—PEG FORMING UPRIGHT OF LATHE; A, Iron Pin. FIG. 2.—FRONT ELEVATION OF REST. FIG. 3.—SIDE ELEVATION OF REST. FIG. 4.—THE LATHE COMPLETE; A, A, Pegs; B, Wood to be turned; C, C, Wedges; D, Ground Level; R, Rest in position. FIG. 5.—SUPPORT TO PREVENT SAGGING; A, Notch; B, Stake, or Wedge to fix Support.

Lest the simplicity of the arrangement should call forth contempt, I may state that it is the only lathe in use among the natives of India, and that I have specimens of its work in furniture which would disgrace no English cabinet-maker. With its aid I have been able to replace some metal parts of a small steam-launch which had been lost in transit, so that its use for working even heavy metal is not to be despised. I will now proceed to describe it.

Get two stout pieces of hard wood, say 18 inches long and some 4 inches in diameter; sharpen one end of each, so that with a heavy mallet or stone the "peg," as I will in future call it, can be driven into the ground. I have drawn the peg squared in Fig. 1, but it is quite unnecessary, though, of course, it looks better. Into one face of the peg drive a piece of iron, say $\frac{1}{4}$ inch diameter, so that about an inch of it stands out. This piece that stands out should be filed to a nice point, not too sharp. Treat the other peg the same way.

Now for the "rest," or hand-rest (Figs. 2, 3). Take a piece of board, say 10 in. by 5 in., and $\frac{1}{2}$ in. thick. In the centre of this cut a hole an inch thick square, and in this fix most firmly a rod of wood, 1 inch by 1 inch by 10 inches long. We have now a board with a stick standing up in the middle of it, and this board is our "rest."

Cut a couple of pieces, say a foot long, out of a stout hedge stake, or similar material, provided it belongs to you, and sharpen an end of each so that they can be driven into the ground. These stakes I will dignify by the name of "wedges" in the remarks that I have yet to make. To all the above add a piece of stout cord, about 6 feet long, and *our lathe is complete.* You may well look astonished, but it is so.

Now to set it up. Say that we want to turn a piece of wood 4 feet long, we rough hew it, and mark a centre at each end as near as we can. We then drive our two "pegs" firmly into the ground with their iron pins pointing towards each other, arranging the distance between them so that from point to point of the pins is a little less than the 4 feet (the length of the wood to be turned). Our piece of wood has to turn on these two pins. Drive one of the wedges into the ground behind one of the pegs, to keep it firm, and placing the marked centre of the wood to be turned against the iron pin, give the other end of the wood a knock with a hammer so as to get a bearing for the pin. The other end of the wood has now to be got on the other pin. This is to be effected by forcing the other peg back a little. As soon as the wood has been got in, the pin will grip it pretty hard, as there is plenty of spring in the ground, but the pin has to be got on the marked centre. To effect this, hold the wood with both hands, and get someone to hit the peg on its face with a hammer; at each blow the peg, and with it the pin, will spring back a little. It is during each blow that the wood must be moved until its marked centre is on the pin. Having

got this centre on the pin, our piece of wood will be in a position to revolve freely. Just drive the remaining wedge in behind the peg, and give each peg an extra knock on the head to keep all firm. The lathe then appears as in Fig. 4. A drop of oil can be placed on the bearings, *i.e.*, where the wood turns on the pins.

I omitted to mention that it requires two persons to work the lathe. But most boys have a brother who will lend a hand, and those who are unfortunate enough to be without one must induce some friend to help them. We will now proceed to work. I will term the one who drives the lathe the assistant, the one who uses the tools the workman. The assistant winds his cord three or four times round one end of the work B, and then sits down on the ground in front of it, with the ends of the cord one in each hand ; by pulling alternately with each hand he will cause B to revolve. When he pulls with one hand B will revolve towards him ; when with the other it will revolve away from him. The workman, therefore, can only cut while the wood is revolving towards him. This is, of course, a disadvantage, but it is not so great a disadvantage as not being able to cut at all. So we must not be proud, but take the goods the gods send us thankfully.

Now for the workman's position. He arranges his rest as near to his work as he can, and then places his left foot firmly on the rod which points towards him, and kneels on his right knee. The rest will now be very steady, and he will be able to apply his tools in the ordinary manner. A little practice will enable him to overcome the danger of digging the tool in too deeply as he applies it at each new cutting revolution. When he has done half the work, and wishes to work on the other end, the cord is removed to that part which is finished.

The work can be removed from the lathe by knocking out one of the wedges and hitting the peg back. It can be replaced with equal ease. If the work is very heavy the pegs may require an occasional knock on the head to keep them quiet.

If any of your readers find this lathe successful, I shall be happy to send you a description of fittings for it to enable them to turn articles which cannot be fitted between the two pins, either on account of the kind of work, or its minuteness. These fittings shall be as simple as the lathe.

In turning a long and thin piece of wood, it may bend or sag in the middle at each pressure of the tool. To obviate this, cut a piece of board into a peg, as in Fig. 5 : Drive it into the ground opposite the middle of the work, so that the work fits into the notch, and drive a stake in behind it to keep it firmly against the work, which will now revolve with the notch as a "bearing." It is almost needless to say that the work should be turned true (this can be done by a light hand) at the part which is to revolve in the said notch.

[I have had much pleasure in finding room for the above paper, from the pen of a gentleman resident in India, for various reasons. Firstly, it cannot fail to be of interest to many who take pleasure in lathes and lathe work, to be brought acquainted with the germ from which all the well-appointed and costly lathes of the present day have sprung. Secondly, it may be the means of giving not a few readers at home and abroad, who may be without a lathe, a wrinkle for rigging up a substitute for temporary purposes in order to carry out some piece of work that cannot be done at all without a contrivance to cause the wood to rotate. Thirdly, because it illustrates the truth of the old saying, "Where there's a will there's a way," by showing how simple, after all, are the appliances that are really needed by those who are earnest in their work and resolute in their intention of carrying it to the desired end. I have written for the proffered description of the fittings.—ED.]

A VIOLIN ON THE GUARNERIUS MODEL.

By EDWARD HERON-ALLEN.

(*For Full-sized Working Model and Diagrams of Guarnerius Violin, see Folding Sheet issued with this Part.*)

I.—INTRODUCTION—INSIDE MOULD AND ITS ACCESSORIES—WOOD—THE BLOCKS—THE SIDES OR RIBS.

IN compliance with the reiterated request of many of our subscribers, I have taken up my pen again, at this present to supplement the series of articles which appeared under the title of "The Violin, and How to Make It," in this magazine during the years 1883-4, by the addition of a paper describing the processes of manufacture of a fiddle made on the *inside* mould, a method of construction differing materially in many respects from that laid down in the series of articles before-named. The substance of the following paper was written for, and is included in, my work, "Violin-making, As It Was and Is" (London : Ward, Lock and Co., 1884), which is an enlarged edition in volume form of all the Violin-making articles which have appeared in AMATEUR WORK, with the addition of several important chapters, appendices, indices, etc. The mould, models, and outlines contained in this paper and the supplement thereto are taken in the minutest facsimile from a magnificent violin by Joseph Guarnerius del Gésu, of the date 1734, the property of M. Prosper Sainton. It is one of the most celebrated and characteristic instruments of this great master's make which exists.

The Inside Mould and its Accessories.—The first thing, as before, to decide upon is the model, and, consequently, the mould on which you are going to build your fiddle. As I gave a mould of a Stradiuarius violin, described in page 265, Vol. II., I now present my readers, as an accompaniment to this paper, with a mould of a Guarnerius violin. It will be seen that the construction of this mould is quite different to that of the one represented by the *Folding Sheet* to Part XVII. In working with this one we shall fix on the ribs *outside* the mould, and the cramping blocks will be fixed on *outside* the ribs with cramps fixed in the holes A, B, C, D, E, F. To make a mould of this sort from any fiddle, proceed, as before, to take the outline on the outline board, or otherwise, and having transferred it to paper, and drawn a centre line down the exact middle, you will have the outline O, O, O. (It will be observed that in the *Folding Sheet*, O, O, O, is only a half outline, but this does not matter, as will be seen further on, for the two sides of the fiddle we are copying are in exact facsimile.) Now, at the distance of about $\frac{2}{15}$ inch inside this line, draw very carefully a second, and you will have the (whole) outline P P P. Let this second or inner outline be traced off and pasted on to a plank of hard, well-seasoned wood $\frac{3}{4}$ inch thick. Trace inside it the six places for the blocks to go, viz., I, J, K, L, M, N, as shown in the plate, and then cut it out most carefully, and you will have a mould as represented by Fig. 1 (which, however, shows the block pieces glued in roughly). Now take another plank, fully $\frac{1}{2}$ inch thick, and cut it exactly similarly to the shape of mould No. 1, so that when the second is placed over the first it coincides so exactly as to appear to be only one solid mould $1\frac{1}{4}$ inch thick. Cramp them together thus exactly, and boring five screw holes, U, V, W, X, Y (*Folding Sheet*), screw them firmly together, so as to make one solid plank. The screws must not be long enough to go through on the other side of this double mould, and the heads must be sunk a good $\frac{1}{12}$ inch below the surface, so that they can be planed over. Now plane down the top half at the upper bouts, so that the double mould is $1\frac{1}{4}$ inch thick at the lower bouts, and $1\frac{5}{32}$ inch at the upper (a difference of just less than $\frac{3}{32}$ inch, which are the right proportions for the ribs of a fiddle. Then bore with a large centre-bit the eight holes A, B, C, D, E, F, G, H, opposite the inner bouts, and the cuttings made for the blocks as shown in the plate. Next take a tracing like Fig. 2 from your original paper diagram, and paste it on a thin leaf of wood, which will give the half outline P P P, by which you determine and correct the outlines of your blocks (or, if you like, take a *whole* outline from P P P, and correct all your blocks together; however, a half outline can be turned over for the blocks on the other side, and ensures their being in contra-facsimile to the others). Next, take a similar tracing of the entire outline (the original paper diagram will do), and mounting it similarly, you have the outline model, O O O, from which you trace on the slabs the outlines of your back and belly. As before, a half outline (Fig. 3) can be taken, and will serve the same purpose, only it must be turned over on the centre line to trace the other half of the table. Your mould and plank outlines being now complete, the next thing to do is to make your cramping blocks, which are the same as described in Chap. II., p. 267, Vol. II., only that they are in this instance made to go outside the mould, instead of inside, as was the case when we were working with an outside mould, and they are represented in actual size to go with our present mould in the *Folding Sheet* by the pieces 1 to 8. As before, they are $1\frac{1}{2}$ inch deep, and fit against the sides, so that the numbers which are inscribed on each cramping block coincide with that drawn on the mould at the points opposite which they go, as in Fig. 4 (which will be fully explained further on). These, therefore, are the operations by which a mould, etc., can be taken from, and for the purpose of copying, any fiddle, and by which those in the *Folding Sheet* were produced; so that if my readers are content to make a Guarnerius fiddle, they have only to make their tracings and plank outlines as described from the plate. From this point I shall assume that we are working with this mould, and write accordingly, though (as will be seen) the processes can be applied to any model; and to avoid repeating my first chapters, where (as is frequently the case) the work is identical, I shall merely refer my readers to the pages where they will find the necessary information, should they have forgotten the work they did before. I may also repeat that any of the processes in the following chapters, which differ from the methods before described, may be pursued with any model or outline, and with any mould whether inside or outside. The main points in which our work will differ (beyond the matter of mould), will be in the slab back, and the spliced head.

Wood.—As before, the first thing after deciding on the pattern is the choice of the wood. As we joined our back and belly before, we will now make them in one piece, and a table in one piece may be either "whole" or "slab." If you turn to Fig. 26, Vol. I., p. 168, these cuttings are explained; for a whole table an exceptionally broad, fine trunk is required, from which is cut a wedge, as at A in that Fig., only twice as broad as that there described, and varying from 2 inches on the thick side to $\frac{1}{2}$ inch on the thin side. This is re-marked on the end, as in Fig. 5, by the line A B, which is then sawn down, and the wedge C thus cut off is sawn up into as many thin strips, $\frac{1}{12}$ or $\frac{1}{10}$ inch

thick, as can be cut, from whence are cut the ribs, which thus match the back in grain, etc., which is a great beauty in a fiddle with a whole back. For a slab back the planks are cut out of the trunk, as at D, Fig. 26, p. 168, Vol. I., which style of cutting shows the grain of the wood running *round* the back in serpentine ovals, which follow the outline of the fiddle, with the curls of the wood running across from right to left in greater quantity, but narrower, than they appear on backs cut "on the quarter," whether whole or joined. I have chosen the slab back partly because it is simpler to work with and makes a very pretty effect, and *partly* (confession eases the soul!) because I have found a very beautiful piece of slab wood in a neglected pile just before commencing this present fiddle, which I want to work up. The strips for the ribs being cut and stored, as in p. 313, Vol. II., the block for the neck must be selected of a small, close curl, to match and contrast with the back. I shall also assume that you have got a piece of belly pine of sufficient size *and* quality (attributes very difficult to find *together*) to make a belly of good acoustic properties.

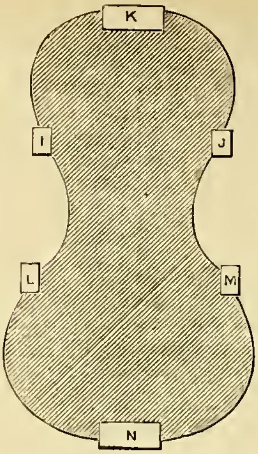


FIG. 1.—SOLID MOULD WITH BLOCK PIECES FITTED.

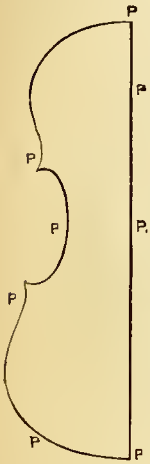


FIG. 2.—HALF OUTLINE OF MOULD WITH BLOCKS.

If you cannot find this, and you cannot get supplied by a good fiddlemaker, make your belly joined as described in p. 169, Vol. I., which is much better than to use a single piece whose grain is wider at one edge of the belly than at the opposite one. Before, however, rejecting a slab as too narrow, *vide* the expedient for increasing the breadth (in the lower bouts) set down (*infra*) in the paragraph "*Back and Belly*." These preliminaries having been settled and arranged, let us, gentle reader, start forth again together to make our second fiddle, and may the success which I trust attended our first efforts attend us again now.

The Blocks.—These are the commencement of a fiddle on an inside mould. For them you must take six little rectangular pieces of fine-grained pine as in Fig. 26, p. 315, Vol. I., which, when set up on edge (*i.e.*, with the grain perpendicular to the plane bench), have all equally a depth of $1\frac{1}{2}$ inch with the top surfaces, as follows: Two for the top and bottom blocks, $2\frac{1}{8}$ inches by 1; two for the upper corners, 1 by 1; and two for the lower corners, 1 by $1\frac{1}{8}$. The bottom edge of each must be square to one side, and both ends of the top and bottom blocks must be squared to the sides thus squared. Two sides of each corner block must be squared to one another. Cut down the top and bottom blocks till they just fit nicely (not too tight or too loose) into the cuts K and N (in the *Folding Sheet*), made to receive them. When fitted, rough the lower half of the side that goes against the mould, and glue it to the lower plate of the mould (glueing the side *only*, not the *ends*) so as to present in section the appearance of Fig. 6. The top and bottom blocks, when glued, must be cramped to the mould by an iron cramp from the holes A and H. The corner blocks are merely fitted to the cuttings I, J, L, and M (*Folding Sheet*), the lower half of *one* side roughed and glued, set in the cuttings without cramps, in the same manner as the top and bottom blocks, and the whole set to dry, presenting the appearance of Fig. 1. It will be seen that all project just below the mould (as below the dotted line A, Fig. 6); this is so to prevent their not being quite flush with the lower surface of the mould. All below the lower surface of the mould must now be removed by turning the whole concern over, wetting the thus presented bottoms of the blocks, and planing them down with a toothed plane till they are even, and plane and true to the lower surface of the mould, so that a straight-edge moved all over the surface shows no light and catches

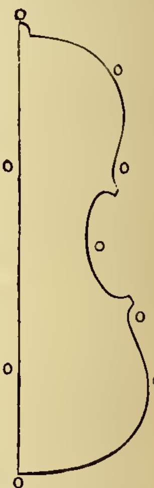


FIG. 3.—HALF OUTLINE OF THE TABLES.

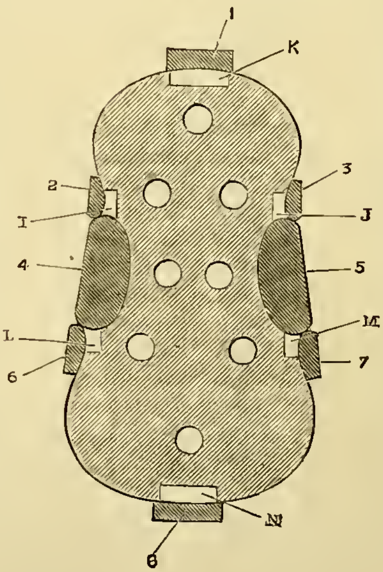


FIG. 4.—MOULD WITH BLOCKS, FITTED AND SHAPED, SHOWING POSITIONS OF THE CRAMPING BLOCKS.

FIG. 5. — WEDGE OF "WHOLE" TABLE, WITH CUTTING A B FOR RIBS C.

FIG. 9. LINING CLIPS.

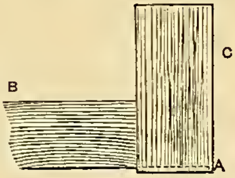


FIG. 6.—SECTION OF BLOCK SET ON THE MOULD.

on nothing. Now with the mould (or ribs outline, Fig. 2) mark on the top and bottom of the top and bottom blocks what wood has to be removed to make the outline continuous at top and bottom, and by this means make the top and bottom blocks even with and part of the outline, as at K in the *Folding Sheet*, being careful, however, to keep them quite true and square to the bottom or flushed edges and lower surface of the mould. Now laying the outline again over the blocks, so that, as before, it coincides exactly with the outline of the mould, mark with a sharp point the exact shape or outline of the corner blocks. Cut away most of the superfluous wood (carefully) by removing the wood represented by the shaded part of Fig. 7, by cutting down the lines A B and B C. Next, with a gouge, cut away the remaining wood D, *inside the* C's, keeping to the lines marked on both ends of the block, so as to have these cuttings quite square to the plane surface of the mould, but leaving the superfluous wood E till the inner bouts are fixed to the blocks and dry, so as to withstand the pressure on the point caused by the glueing of the C's (or centre bouts) to the blocks. If, by mishap, you cut too much, so that the inside of the corner is *not* square to the mould, the defect must be repaired by cutting a little curved chip from the superfluous wood of another block with a gouge, and glueing it on where the want is found ; the block with the added chip can then be recut as originally. The next operation is the preparation of :—

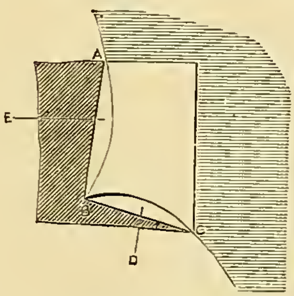


FIG. 7.—STEPS OF THE CUTTING OF THE CORNER BLOCKS.

The Sides or Ribs, and the fixing of the C's. Select a plank of maple, whose grain matches the back, and prepare from it enough strips 1½ inch broad and $\frac{1}{12}$ inch thick, to make two strips 5¾ inches long for the inner bouts or C's, two 7½ inches long for the upper, and two 10 inches long for the lower bouts. These must be cut and planed down as described in page 313, Vol. II. They may be further regulated as to thinness by setting the *fillière* to $\frac{1}{20}$ inch, and scraping the strips through like purfling. (The *fillière* is an appliance used for thinning down plane-veneer to make purfling. It consists of a plane-iron, which can be adjusted by means of a screw, at any required distance from the polished surface of a steel plate over which it is held at right angles by a bent arm. It is used thus : If it is required to give a strip of wood an uniform thickness of $\frac{1}{16}$ inch, the blade of the *fillière* need only be "set" at this distance from the plate and the strip carefully and strongly pulled through between the edge of the blade and the plate till the desired uniformity of diameter is obtained. By this means a strip of plane-veneer may be evenly reduced to a substance of $\frac{1}{48}$ inch or even less.) As before, glue linen on one end of the upper and lower bouts, and on both ends of the C's, which, when dry, must next be bent, fitted, and fixed, proceeding as follows :—Bend the C's, as described in page 313, Vol. II., until they just fit into the inner curves of the mould. When this object is attained, take a small stick of old soap, and thoroughly soap the *mould* where the C's will press against it, *but not letting the soap touch the blocks.* This is to prevent the ribs from sticking to the mould if by mischance the glue should run anywhere but on the blocks. Next clear all traces of linen and glue off the ends of the C's, and file the whole inner surfaces of them quite clean. Now plentifully coat the inside of the blocks (the line D, Fig. 7) with good glue, set the C's in the inner bouts, and fix them with the cramping blocks D and E, *Folding Sheet*, by means of cramps set in the holes D and E. The ends of the C's must be pressed tight up against the glued blocks, by pushing in between them and the cramping blocks, at the top and bottom of the latter, little wedges and chips of wood so as to ensure a close and firm contact between the ends of the C's and the inner or glued surfaces of the corner blocks. The edges of the C's jutting just below the lower surface of the mould (in the same way as did the blocks below the line A, Fig. 6) must, when the glue is dry, be filed down flush and plane with the lower surfaces of the mould and blocks. Lastly, reduce to manageable length the ends of the C's which project beyond the corners. The next operation is the cutting to outline of the outer faces of the blocks E, Fig. 7, which must be done in the same way as the inner faces, keeping them quite square to the plane surface of the mould, blocks and C's. In cutting this

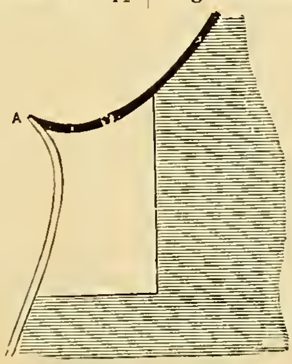


FIG. 8.—SHAPING OF THE LOWER BLOCK AND SETTING OF THE C'S AND LOWER BOUTS.

face you will make the C's work into the outline by cutting them to a point, as at A in Fig. 8. When this is safely and correctly accomplished, you can proceed to bend and fit the upper and lower bouts, beginning with the latter. First bend and fit the ends which fit against the corner blocks and are protected with linen, and then the rest of the strips, after which you must make the join at the bottom. This is done by taking each lower bout (as fitted) separately, and, setting it on the mould, mark on the edge the point where it is touched by the centre line drawn down the mould; from this mark, by means of a square, draw a line across the strip, as described in page 314, Vol. II., fit the other lower bout similarly, and if your marking and cutting have been true to the centre line of the mould, a perfect join will be the result. The join being thus made, and the ends of the lower bouts freed and cleaned from glue, linen, etc., soap the sides of the mould (carefully avoiding the blocks), and coating the bottom block and the still exposed surfaces of the lower corner blocks. and the bevel at the ends of the C's, with glue, fix the lower bouts to the mould by means of cramps with the cramping blocks 6, 7, and 8 (*Folding Sheet*), in the same manner and position as you fixed the C's. The upper bouts are next fitted in a precisely similar manner, only that you need not trouble to make a close join at the top. Now cut down the projecting pieces of the corners, and make them square to the mould, as in Fig. 8, by means of a knife, cutting from the edges to the centre of the strip, for fear of splitting off pieces, and finishing with a file and square. Then go round the lower edges of the ribs, which just project (as did the C's) below the lower surface of the mould, and render them flush and level with the lower surface of the mould with a knife and flat file. The next thing is to regulate the height of the ribs, which with this model is at the bottom block $1\frac{1}{4}$ inch (or $14\frac{1}{2}$ lignes French), and at the top block $1\frac{5}{32}$ inch ($13\frac{1}{2}$ lignes French.) [The French measure is, it will be observed, larger than the English, but I prefer the latter ($1\frac{1}{4}$ and $1\frac{5}{32}$)]. Set off on the gauge $1\frac{7}{24}$ inch, and from the lower surface of the mould trace this breadth round the lower bouts and C's from upper corner to upper corner. Now, reducing the gauge to $1\frac{5}{32}$ inch, trace a line $1\frac{5}{32}$ inch from the lower surface of the mould, about two inches long, opposite the top block. From the line at $1\frac{7}{24}$ inch to the line at $1\frac{1}{5}$ inch the upper edges of the ribs and blocks must gradually decline ; therefore begin by wetting the upper surfaces of the blocks (to make them cut easily), and then level the ribs and blocks down to the top surface of the upper plate of the mould [which is already (*vide* paragraph "*The Inside Mould and its Accessories*") of the proper thicknesses], so that a straight-edge lies true and flat across the top of the mould. Now by loosening the screws, U, V, W, X, Y (in the *Folding Sheet*), take out the upper plate of the mould, and proceed to prepare and fit your side-linings to the upper edges of the ribs, precisely as you did before, first cutting two grooves in the corner blocks, as before set down, in which to fit the linings of the centre bouts. When fitted, proceed to glue and fix them as before described in page 316, Vol. II. It is as well to bend both sets of linings, so that when the mould is taken out you will not have another bending job to do. When they are glued it will be necessary to fix the linings of the C's with lining clips, two or three being necessary. *Lining Clips* (Fig. 9) are used to keep the linings against the ribs (especially the C's) when being glued. About a dozen is an ample supply ; they are best made of box or some other hard wood. If the upper and lower bout linings are well cut they will not require clips, but if a little short they are good as a safeguard, and to make assurance doubly sure. When the linings are fast, cut them to a wedge shape, as shown by Fig. 31, page 315, and described in page 316, Vol. II. Next cut the blocks to shape, that is to say, their top halves, which stand above the mould. This is done with a sharp, broad gouge, cutting down but small splinters at a time, and breaking them off at the surface of the lower plate of the mould. It was observed in page 316, Vol. II., that the Guarnerian block is different to the Stradiuarian, being more curved, as in Fig. 31, p. 395, Vol. I., the block, Fig. 30, p. 315, Vol. II., being rather made by rounding off the angles at the ends of the block. The present (or Guarnerian) block is shaped so as to be a continuous curve from lining to lining, as in Fig. 31, p. 395, Vol. II. Then go round the linings and blocks (as cut) with a file and sand-paper, to smooth and soften their inner surfaces, and as far as you can go at present the *inside* of the fiddle is finished. Finally, go right round the *outside* of the ribs with a sharp scraper, so as to remove all dirt and inequalities, and make the exterior thoroughly smooth with fine sand-paper, after which, the ribs being, as far as you can go for the present, finished, they can be put out of harm's way till the back is ready to go on.

(*To be continued.*)

HANDY WORK IN FARM AND GARDEN.

By GEORGE EDWINSON.

IV.—HURDLES—WIRE FENCES—IRON RAILINGS, ETC.

IT frequently happens that a farmer wishes to divide his field for a short time into small plots or enclosures, as, for instance, when he wishes to fold sheep on a field of turnips, or rape, or tares, or clover. At such times a movable fence is desirable—one that

can be easily and quickly erected and as readily removed to another site when the sheep have devoured all the food on which they were first folded. Such a fence may be constructed of hurdles, and of these there are no less than five varieties, comprising bough or wattle hurdles, gate hurdles, iron hurdles, portable hurdles, X hurdles, and many others.

Wattle Hurdles.—Wattle hurdles are easily made from brush-wood, and are valuable as a protection to ewes in lambing time when a close-hedged paddock or permanent fold cannot be provided for them. They make a light and not very durable fence, which is therefore not the best against pigs, horses, and cattle—indeed, this fence should not be exposed to the attacks of hungry pigs and cattle unless backed up with stronger hurdles. The work of making those hurdles is excellent winter employment for aged and delicate men, since it can be carried on in a shed protected from inclement weather. Brush-wood of any length and size may be employed, providing there are enough straight sticks 6 feet long and from 1 to 2 inches in diameter to form standards. The work resembles basket-making, and is performed solely by the aid of three tools, a light bill-hook, a pair of leather gloves, and a stool or frame. This frame is merely a log of wood let into the ground, and pierced with holes 6 inches apart, throughout its length ; the holes may be bored with an inch auger or centre-bit, and the appearance of the frame when finished will be seen by reference to Fig. 26. First trim out all the sticks deemed suitable for standards, cut these into lengths of from 4 to 5 feet, sharpen the ends of them as shown (Fig. 28) to go in the holes in the frame, and lay them in a heap handy to the frame. Stick enough of these in line in the frame to make the required length of hurdle, and see that the two end standards are stouter than the rest, see Fig. 27. Then take a long lithe bough and interlace it with the standards from end to end of the frame (if the bough is long enough) then draw it tight, press the brush down with the right foot and twist the stump end of the bough around one of the end standards, and turn this part back between two or three standards if it is long enough. If it is judged that the bough is not long enough to reach from end to end, and leave a piece to be thus turned back, we must begin in the middle of the row of standards and work to one end, then commence with another bough in the middle and work to the other end. Thus proceed to interlace the standards with boughs alternately from each end, and beat each bough down firm as they are laid until the top is nearly reached ; then twist the two topmost boughs together and intertwine them as they are being laid, to form a firm top for the hurdle. Finally, trim off all straggling sprigs with the bill-hook, and pull the hurdle out of its frame, complete as shown in Fig. 29. It is best not to leave too much spray on the boughs or they will be difficult to interlace, and they will not make a neat hurdle. Oak, ash, withy, willow, hazel, black-thorn, white-thorn, wych-hazel, acacia and any other long tough underwood is suitable material for those hurdles. The best varieties are made of split wattles, *i.e.*, long oak or hazel sticks split lengthwise and interlaced as above directed. In fixing those hurdles they are secured to stout stakes, driven into the ground, by twisted hazel, oak, or withy bands. Wattled enclosures form an excellent protection to young poultry on open plains and commons, and for this purpose may be made in circular open top coops of about 3 feet in height, and of almost any diameter. A net-work of boughs stretched across the top will serve to confine the hens, and the enclosure can be removed to fresh pasturage as desired. Wattle hurdles are also available as building material for light structures being tied by ropes or bands to a skeleton frame-work of wood, and in this way forming a shed offering a protection from the glare of the sunshine in summer.

English Frame Hurdles.—Frame or gate hurdles as shown (Fig. 35), are made of split ash or oak saplings, ash being used by preference because of its tough splitting qualities. Any tough splitting wood may be used in their construction, and I have seen some useful hurdles made of split larch poles. Nearly every part of long straight poles may be utilized in the manufacture of those hurdles. The stump ends tapering from $3\frac{1}{2}$ to $2\frac{1}{2}$ inches in diameter through a length of 6 feet, may be cut off in lengths of from $5\frac{1}{2}$ to 6 feet for tall hurdles, or lengths of 5 feet for short ones, and split to form the end styles ; the long straight pieces left over may be split to form the rails, and poles too small to furnish styles may also be split for rails ; whilst short tops of poles and crooked pieces may be split to form stays. The method of making those hurdles is clearly shown in the sketches, and it will be seen to be similar to that employed in the erection of railway post-and-rail fences. The tools required will be as follows : A hand-saw, a light sharp axe or hatchet, a half-inch auger, a quarter inch auger or large gimlet, a strong mortising chisel, a mallet, small hammer a steel punch, and a two foot-rule. If the hurdles are intended to stand 5 feet out of the ground as a fence, the end styles must be cut to lengths of 6 feet, thus allowing 1 foot to be pointed for insertion in the ground. This would be a very tall hurdle, and would require 5 bars or rails ; but the ordinary hurdle only stands some 4 feet out of the ground, and has only 4 rails, the length of styles in these short hurdles is therefore only 5 feet. The larger or stump end of the style is pointed with the hatchet and shaped as shown (Figs. 30 and 35).

A large number of these may be so pointed and piled up ready for the next operation of marking out and spacing the styles for the rails. A pair of trestles will be found handy to rest the styles on, whilst they are being marked out and the mortises cut for the rails.

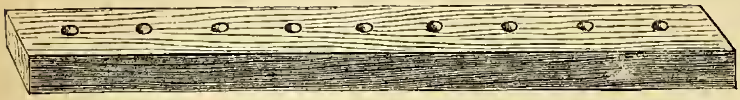


FIG. 26.—FRAME FOR WATTLE HURDLE.

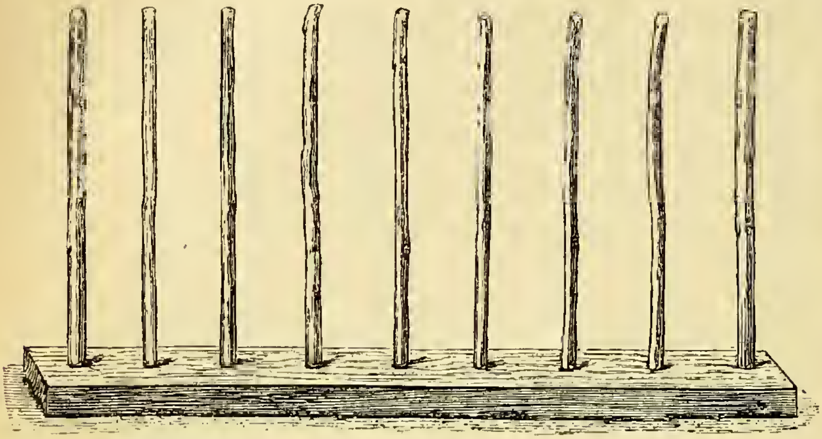


FIG. 27.—STAKES SET IN FRAME FOR MAKING WATTLE HURDLE.

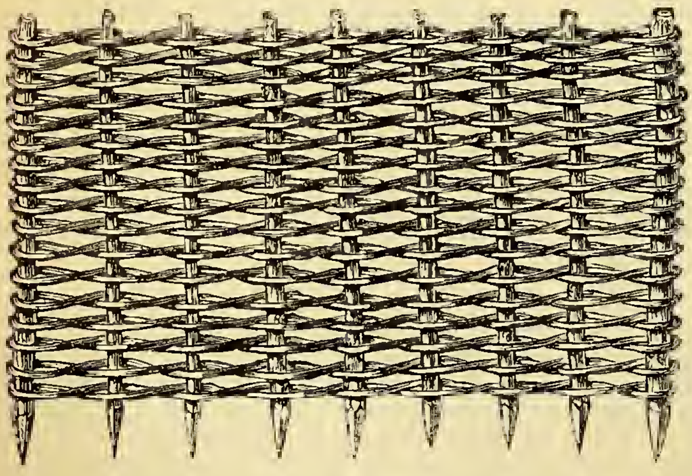


FIG. 29.—WATTLE HURDLE, COMPLETE.


FIG. 28. STAKE SHARPENED AT END FOR WATTLE HURDLE.


FIG. 37. IRON POINT FOR PUNCHING HOLES IN HOOP IRON BAND.


FIG. 31. UPRIGHT CENTRAL STAY FOR FRAME HURDLE.


FIG. 36.—HOOP IRON BAND PIERCED FOR NAILS.


FIG. 32.—DIAGONAL STAY FOR FRAME HURDLE.


FIG. 34. PIN FOR END OF RAIL.


FIG. 30.—POST FOR FRAME HURDLE.

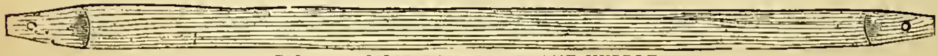


FIG. 33.—SPLIT RAIL FOR FRAME HURDLE.

Mark out the styles as follows: Measure 6 inches from the top, then mark out a space $2\frac{1}{2}$ inches wide, measure 10 inches from the lower mark, and mark another $2\frac{1}{2}$ inches space, and so on, as shown in the following diagram:—

6 $2\frac{1}{2}$ 10 $2\frac{1}{2}$ 9 $2\frac{1}{2}$ 7 $2\frac{1}{2}$ 6
— — | — | — — — — | — | — — — — | — | — — — — | — | — —

finishing off with 6 inches from the lowest mark to the shoulder of the point, or 18 inches from this mark to the point.

When all the styles have been marked out, proceed to bore the holes with the larger auger, to form the rounded end of the slits for the rail-ends, as shown in the lower end of Fig. 30; this is best done with the styles on the ground, the right foot being placed on the style to keep it steady. Next rest the styles one by one on the trestles, sit astride a style, and proceed to cut out the slits with the mortising chisel, using a wooden mallet to drive the chisel; the slits should be

from $2\frac{1}{4}$ inches to $2\frac{1}{2}$ inches long, if full $2\frac{1}{2}$-inch rails are used. The slits must be cut shorter if rails of a smaller diameter only are available.

After all the slits have been cut, some thin $\frac{1}{2}$-inch hoop-iron must be procured, and the tops of the styles bound with bands of hoop-iron (as shown in Figs. 30 and 35), to prevent the tops from splitting when the hurdles are driven into the ground. Each length of hoop-iron should have seven holes punched in it for nails (as shown in Fig. 36) with the punch, as illustrated in Fig. 37, and the band must be secured to the style with $\frac{3}{4}$-inch iron clouts or flat-headed nails. The holes may be punched in the iron as the band is being put on, as follows: First punch a hole in the end of the band, and nail this in the centre of the flat side of the style. Bend band around the style, and give it a few light blows with the hammer to make it fit. Then punch a hole exactly opposite to the first on the rounded side, and

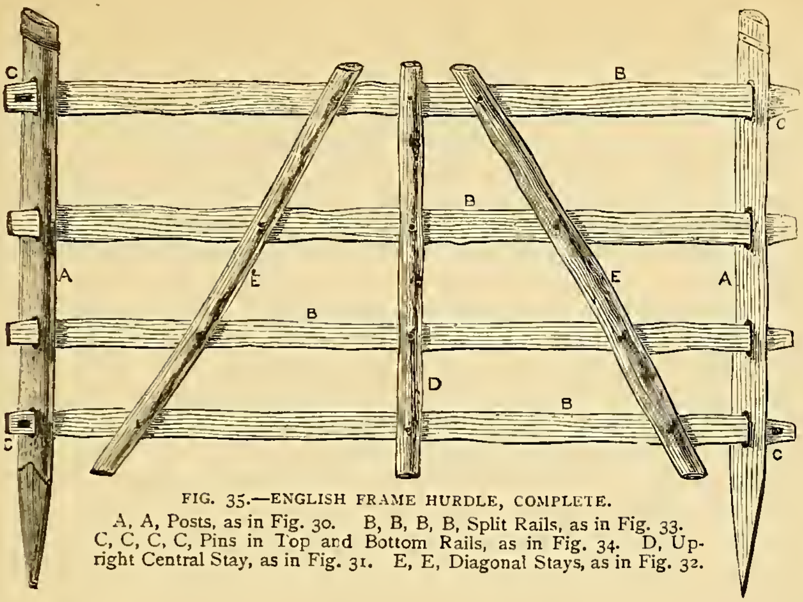


FIG. 35.—ENGLISH FRAME HURDLE, COMPLETE.
A, A, Posts, as in Fig. 30. B, B, B, B, Split Rails, as in Fig. 33. C, C, C, C, Pins in Top and Bottom Rails, as in Fig. 34. D, Upright Central Stay, as in Fig. 31. E, E, Diagonal Stays, as in Fig. 32.

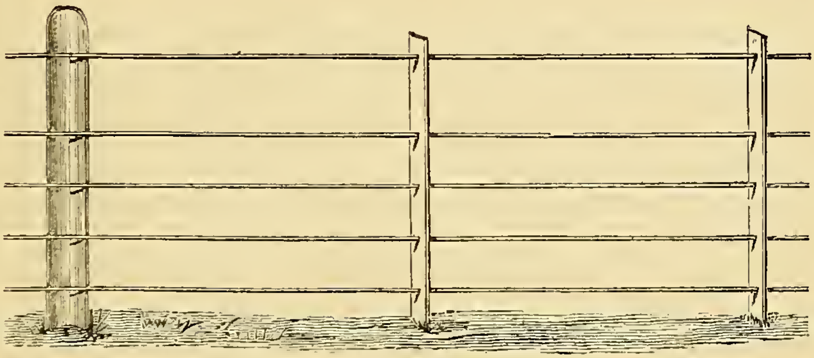


FIG. 40.—CORRIMONY WIRE FENCE.

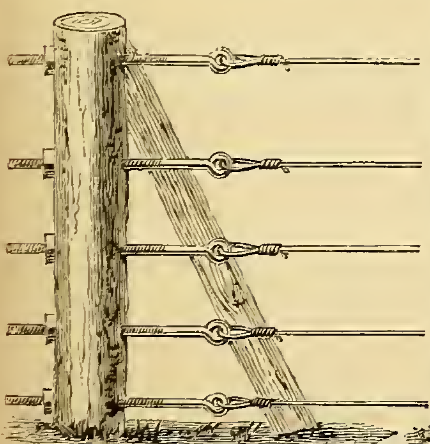


FIG. 38.—STRAINING POST, WITH EYEBOLTS FOR ATTACHMENT OF WIRES.

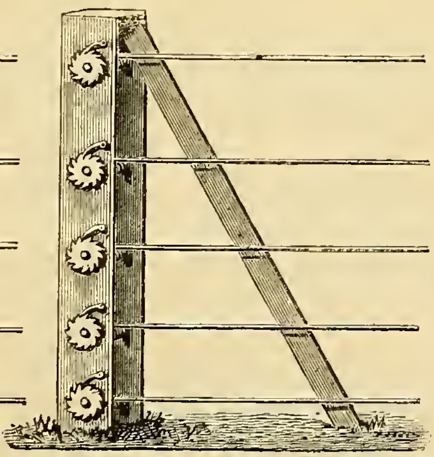


FIG. 41.—HOLLOW STRAINING POST SUITABLE FOR CORRIMONY WIRE FENCE.

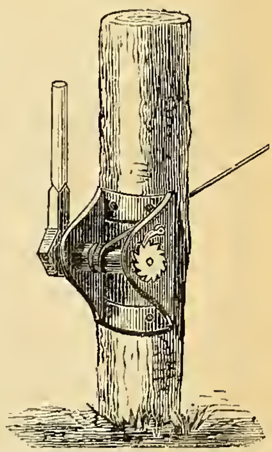


FIG. 39.—RATCHET BRACKET FOR STRAINING WIRE FENCES.

secure it there with a nail. Next bend it around to overlap the first end 1 inch, punch a hole through the two thicknesses, and secure them together with a nail. Then punch the remaining holes, and nail as required. In out-of-the-way places where hoop-iron and nails are not easily obtained, the styles may be left unbound; but the hurdles are not so durable as those bound with iron.

The length of the rails must depend upon the length of moderately straight and uniform poles available, a useful length being 7 feet, but shapely hurdles may be made with rails 6 feet in length. These are pointed at the ends (as shown in Fig. 33), and the ends are fitted in the slits cut in the styles, the rails being put in with their flat sides all facing one way. When the rails have all been fitted in their places, tighten the styles on their ends with a few blows from the mallet, and secure the rails with a few nails driven obliquely through their ends into the styles. Another effectual method for securing them is shown at Figs. 33 and 34.

Select for the top and bottom rails a pole stouter than the rest, and adapt the pointed ends to the slits, so as to fit them in tight and prevent the styles from slipping inwards. Then bore a hole with the small gimlet in each protruding end outside the styles, close up to each style, and drive in a taper pin of ash wood (Fig. 34) to prevent slipping outwards. The hurdle is now made more firm and durable by nailing on three stays, as shown in Fig. 35. The tops of these stays should stand 2½ inches above the top rails, and hang 4 inches below the bottom rails. This device, together with the protruding ends of styles and rails, give a rough appearance to the whole fence of hurdles, and deter cattle from attempting to leap over or bear with their necks on the top rail, whilst sheep and lambs are also deterred from thrusting their heads under and between the rails.

Frame hurdles are formed into a fence by the aid of a crowbar and a heavy mallet or billet of wood. Holes are made for the points of the styles with the crowbar, and the hurdle is driven into those holes by heavy blows on the bound end of the styles from the wooden billet. I have seen some farmers and their men use only a crowbar in putting up hurdles, using this tool to drive in the styles; but this practice is most injurious to hurdles, since the bar is apt to split the heads of the styles. Two men should be employed to put up a hurdle fence—one man to use the crowbar and the other man the billet as a tool. When hurdles are erected as a fence against heavy restive bullocks, a thick stake should be driven into the ground between each hurdle at the ends, and those ends secured to the stake by a twisted hazel band.

Care and Repair of Hurdles.—The most frequent injury to hurdles is that of having the points of the styles broken off in moving them. Those points are liable to rot from frequent use in wet soil. To prevent premature rot it is advisable to char and tar the points of styles before they are made up, and care should be taken to always well loosen the hurdle by swaying it to and fro sideways before attempting to lift it out of the ground. If the hurdle is merely pinned together it will be quite easy to repair a broken style, and it will be found to be more economical to repair hurdles than to prop them up with stakes and bands. The work of overhauling and repairing should be regarded as a regular winter job for rainy days. Hurdles should be stored under the shelter of a shed when not in use, or built up in stacks and thatched during the winter, to keep them dry. If exposed to all weathers, ranged in ranks against a hedge, the wood of hurdles soon decay, and their points rot away.

Scotch Hurdles, or flakes, are similar in form to those just described, but they are made of sawn larch or deal quartering, the styles of stuff 2 inches by 3 inches, and 4½ feet long; the rails of flat lighter wood, 9 feet long, supported by a centre brace and two diagonal stays. The flake is fixed in the ground in a position inclining away from the sheep, and is supported by "rances," or inclined stakes, pinned to the styles. They are clumsy, weighty fences, with nothing to recommend them over those just described.

Welsh Hurdles are formed of similar materials as those employed in English hurdles, and they are mortised together in a similar manner; but the styles are pointed at both ends, and are thus reversible. The rails are from 7 feet to 9 feet long, and placed at equal distances apart, and are stayed by one brace in the centre, with two crossed diagonals on each side. The only advantage in this form lies in its reversible styles, allowing the hurdle to be used upside down if the points are broken.

Iron Hurdles are much in vogue with farmers and stock breeders, who can afford to buy and easily obtain them; but they do not come within my province in this series, for few persons would attempt their manufacture on the farm. They may, however, be noticed in the series on "Smithing and Forging," where the repair of iron fences should receive attention and treatment.

Rack and Cross Hurdles.—Several other forms of hurdles are in use in various parts of England. Among the many may be named the Rack hurdle, so named because it is made in the form of an oblong frame crossed with vertical bars, similar to those in a sheep rack. This hurdle is fixed in a position inclining from the sheep, and supported, like the Scotch flake, with rances. Sheep can be fed by placing the hay or other provender outside the racks, or these may be placed

close up to the growing crops for the sheep to help themselves. Another useful hurdle is that known as the revolving or X hurdle. It is made as follows: Select a straight larch or ash pole, about 4 inches in diameter, and some 9 or 10 feet in length. Pierce this pole throughout its length with $1\frac{1}{2}$ inch holes, 6 inches apart; then bore another set of holes diagonally across the first set alternately is such a manner as to ensure the stakes that are to be driven in them, assuming the form of the letter X. Into these holes drive and fix firmly a number of straight stakes of about 5 feet in length, and point them at both ends. Hurdles thus formed will stand anywhere in a field, and may be moved by simply rolling them over. They can be secured to each other by willow rings or hazel bands passing over the end stakes, and they form an excellent protection to flocks from attacks by dogs, since the fence is a perfect *chevaux de frise* of pointed stakes.

Wire Fences.—When large estates of land are required to be divided into fields of a permanent character, and these must be fenced in a short space of time, a strong fence, easy of construction, is most desirable, and this want is met in wire fences. These have gradually crept into extensive use in England and her colonies during the last twenty years, and are fast superseding the old style of wooden fencing where wood is scarce and labour is costly. The increased demand for this kind of fence has stimulated makers into a healthy rivalry, aiming at the cheapest and most useful fence, with the result that most excellent wire fences may now be put down at a cost of £50 per mile. The most common and old style of wire fencing is constructed of iron wires stapled to a line of wooden posts, the wires being substituted for the wooden rails in the post-and-rail fence formerly described. The wires are stretched along by the posts, and are stapled thereto with iron staples. At intervals of one hundred yards, or more, stout posts with supporting struts are inserted to withstand the longitudinal strain, and the wires are strained up to these posts by means of an instrument worked by a long screw and lever. Formerly the wires were fastened to the straining-posts by being twisted half around them, and stapling them there; but it was found that the wires of such fences often snapped in two in frosty weather, and sagged in hot weather, owing to expansion and contraction of the wires, due to changes in the temperature of the atmosphere. It was, therefore, found necessary to adopt a method of fastening the ends by which the lines of wire could be drawn tight or slackened at pleasure. This is done by looping the ends into eye bolts threaded with long screws passing through the posts and struts (as shown in Fig. 38), and secured by a nut. Wire fences thus constructed can be altered to suit the variations of summer and winter temperature, and thus many a rupture be prevented. A further improvement in this direction has been made by the invention of straining and winding brackets, which are permanently fastened to the straining-posts, and used as shown in Fig. 39. These cost from 1s. 4d. to 3s. 6d. each, and their low price, coupled with their usefulness, is likely to cause their substitution for the old methods of straining and fastening the wires.

Wooden posts are, however, now falling into disuse in all districts, except those where wood is cheap and plentiful. Makers of wire fencing supply iron posts, fitted with bracket winders and strainers, and a new system of fencing named "Corrimony wire fencing," introduced to this country by New Zealand colonists, does away with the necessity of putting in such a large number of posts as was at one time deemed necessary. In this system the posts are placed from 12 to 22 yards apart, and the intervening spaces are supported by "droppers" placed at intervals of 6 feet apart, as shown in Fig. 40. This fencing is manufactured by Messrs. Bayliss, Jones, and Bayliss, at *Wolverhampton*, and is delivered free on board, at Liverpool or London, at £52 15s. per mile.

Plain wire fencing has its disadvantages when employed against heavy stock, and in a wild country inhabited by heavy wild animals; these push and rub against the wires and strain or break them down. To avoid this trouble, a new kind of wire has been invented to prevent such animals from damaging the fence. It consists of two wires, twisted together, and holding at intervals of 5 inches, short pieces of stout steel wire pointed at both ends. Barbed wire fencing thus constructed will entirely ward off intrusion by wild heavy animals, and is said to be proof against the attacks of flocks by dogs. Such fences cost about £60 per mile. Many other forms of iron fencing are in use in this and other countries, and not a few are illustrated and described in a little book, written by Mr. John Scott, and published by Messrs. Crosby Lockwood and Co., *London*. Persons interested in this subject will do well to buy this book, the cost of which is only 1s. 6d.

(*To be continued.*)

WINDOW SCREENS IN FRETWORK.

By "PITCHPINE."

IF, dear reader, you live in London, the above title will appeal to your sympathies at once, unless by a long course of training you have become inured to the existing state of things, and have forgotten what privacy is like. The average London builder in his race for wealth, has made strenuous

efforts to put three houses on to the space that should be occupied by one, and so much success has attended his little schemes that, although you cannot quite shake hands with your opposite neighbour through the back windows, he can, without much effort, criticise your breakfast table from his bed-room window while he puts the finishing touch to his toilet. In return for his impudence you may have the satisfaction of knowing, if you are inclined to play the spy, whether he indulges in eggs with his morning rasher of bacon, or if he takes sugar with his tea.

If you venture out into the back space which the builder has by law been compelled to leave for breathing room, to do a bit of rough carpentering, you immediately find yourself the "cynosure of neighbouring eyes," and when you viciously strike your thumb nail in mistake for the other nail, you become painfully aware, as you dance round with your thumb in your mouth, that the people at half a dozen windows have retired behind the curtains to indulge in a good laugh, while another half dozen, whom you would like to annihilate on the spot, come a little closer to the glass and laugh in your face. Consequently, if you are of a retiring disposition and have no taste for public exhibitions, you don't often venture out at the back, but keep within doors and adopt such methods as are within your reach, of shutting out the prying eyes of your neighbours. If the house is your own, may be

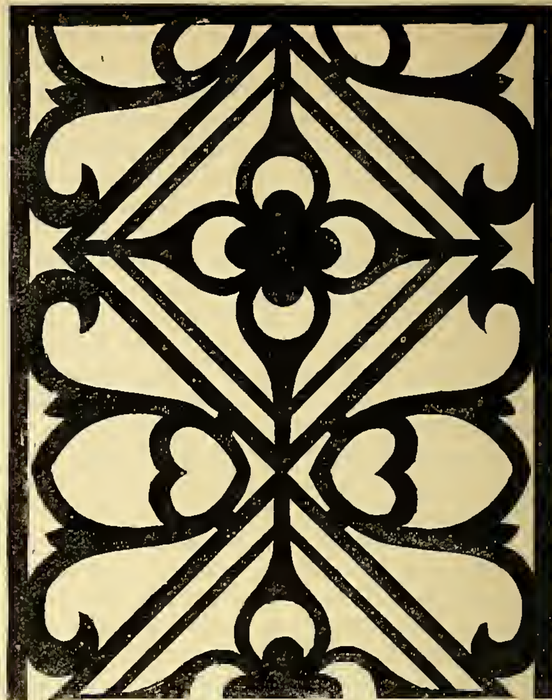


FIG. 2.—ALTERNATIVE DESIGN FOR PANEL IN WINDOW SCREEN.
The Pattern to be repeated to requisite length of panel.

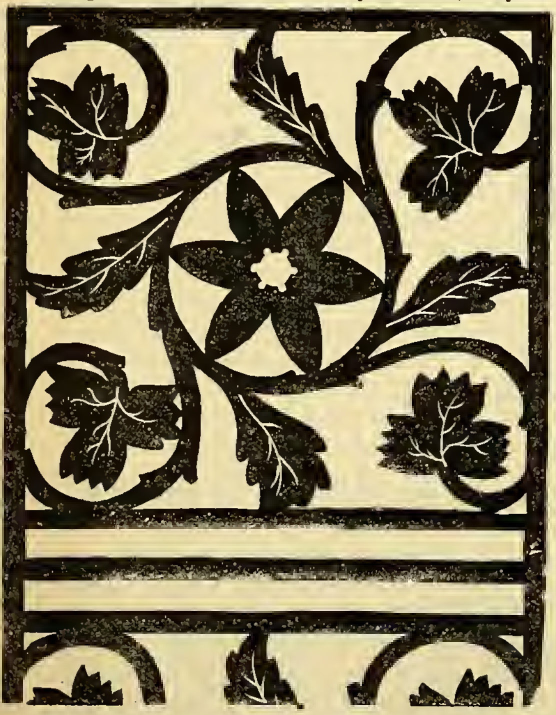


FIG. 1.—PANEL FOR WINDOW SCREEN IN FRETWORK.
The Pattern to be repeated to requisite length of panel.

you put in a stained glass window, or you use one of the many imitations of stained glass. If from compulsion, or otherwise, you are of an economical turn of mind, you perhaps use white paint to make a vile imitation of ground glass, and are afterwards disgusted with the result. You then proceed to make a dreadful mess, and spoil the paint on the window frame in your efforts to undo your handiwork.

Probably, like the great majority of householders, you use a blind of a more or less elaborate construction. Now a blind, to be at all satisfactory, must have a good appearance, and if rather out of the common so much the better. Any way it must not stop too much of the light, must stop inquisitive glances entirely, and will only be required to cover more or less of the lower half of the window. Fretwork appears to me to meet these requirements fairly well, and I think it presents a comparatively unworked field for the energy of some of our many fretworkers.

The blind consists of a framework divided into panels, each of which is fitted with a fretwork design.

The patterns here illustrated can be cut in $\frac{1}{8}$ inch white wood. I found holly very suitable for the purpose. It will considerably reduce the labour of cutting if you cut four or five thicknesses at the same time, which you can easily do by fastening the pieces together with fine brads or pins put through those portions of

the pattern that are afterwards to be cut away. The best way to go to work is to cut the pieces of wood approximately to size. Paste the pattern on one of them and then fasten together the number of pieces which you intend to cut at one operation, having the piece with the pattern attached on the top. Now square up to exact size and then proceed to cut the pattern. If you cut the pattern first and try to square up afterwards, you will probably make a mess of it by breaking several pieces; moreover, it is much easier to work four or five thicknesses together than one single fragile piece that will not stand up against the tool.

I should recommend you to make the framework of either oak or ash, and finish it a dark colour. If you use oak fumigate it to a dark brown, if ash ebonize it so as to be in contrast to the white wood of the fretwork panels. The length of the panels depends, of course, upon the height of the blind, which will vary according to circumstances; but having decided this you have merely to repeat the pattern given a sufficient number of times to fill the space required, taking care in the case of the pattern represented in Fig. 2, that the second tracing joins properly on to the one already traced. The simplest plan is to rule two parallel lines the width of the pattern apart and the length required for the panel, and then fill in the pattern by tracing one underneath the other.

But to return to the framework. First plane up two pieces of wood for the top and bottom of the framework, $\frac{5}{8}$ inch thick and 1 inch deep. A B, Fig. 5, and A B, Fig. 3, in section. The chief difficulty in making a framework of this description, consists in keeping your wood out of "winding," as it is called. The result of having a twist or winding in either of the pieces of wood used, being that the frame, when put together, instead of lying flat, as it should do when placed on a level surface, will touch the surface on which it is placed, at the two corners diagonally opposite, while the other two corners will twist upwards or downwards, more or less, according to the amount of twist in the wood. The ordinary test with the square will not detect the error, as the piece of wood may square correctly at any portion of its length, and still be in winding. To ascertain this, take two parallel pieces of wood, B and C, Fig. 7, and place them some distance apart upon the piece of wood to be tested, A, Fig. 7, then look along them in the direction of the dotted line. If the tops are parallel with each other, the piece of wood to be tested is so far true; but if not, it is in winding, and must be rectified before going further, as it is only waste of time and material to frame up stuff that is not perfectly true.

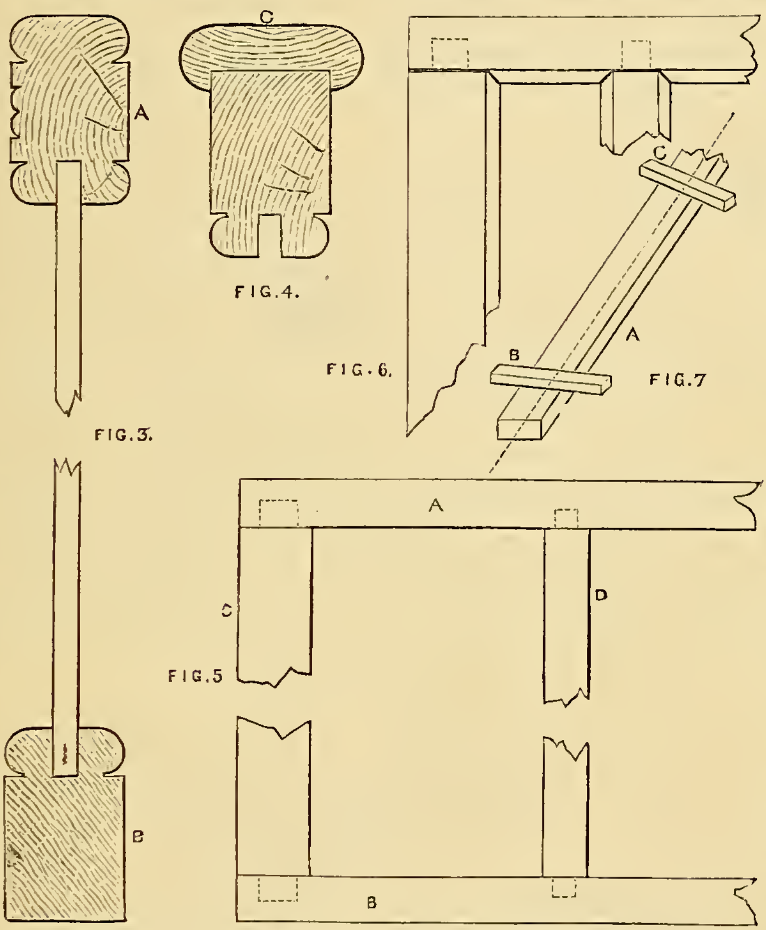


FIG. 3.—SECTION OF BLIND—Full size. FIG. 4.—ALTERNATIVE SECTION OF TOP RAIL—Full size. FIG. 5.—PART OF ELEVATION OF FRAME WORK on Scale of 3 in. to 1 ft. FIG. 6.—DIAGRAM ILLUSTRATIVE OF MITRING OF BEAD WORK ON FRAME WORK—not to Scale. FIG. 7.—METHOD OF TESTING WOOD TO SEE IF IT BE OUT OF WINDING.

Having planed up two pieces for top and bottom quite square and out of winding, in the same manner prepare the two side-pieces, C, Fig. 5, $\frac{5}{8}$ inch thick, and $1\frac{1}{2}$ inch wide. The intermediate bars, D, Fig. 5,

which divide the panels, are $\frac{5}{8}$ inch thick, and $\frac{3}{4}$ inch wide, and must be prepared with the same care as the other pieces. Mark one face of each of the pieces, and keep this for the front surface in working and fitting up. Now take the top and bottom pieces, and along the centre of one of the $\frac{5}{8}$ inch edges, on each plough $\frac{1}{8}$ inch groove, $\frac{1}{4}$ inch deep. In cutting these, and the following grooves, gauge in each instance from the marked surface; the grooves will then coincide with each other when the framework is fitted together. Then take the two end-pieces and groove them in the same way. Now take the middle uprights and plough a similar groove on both $\frac{5}{8}$ inch edges of each upright.

If you want a perfectly plain frame, you may now put the pieces together with mortise and tenon, as shown in Fig. 5. But it adds greatly to its finished appearance to work it as shown in Fig. 3, which is a section. Run beads on each of the four edges of the top piece, and if you care for it, you may also flute the front and back surfaces as shown at A, Fig. 3. Run beads on the two inner edges of each of the side-pieces, and on all four edges of each of the intermediate bars.

Having beads on the edges, you will not now be able to frame up the wood in the same manner as when it was plain, for it is evident that if the square edge of the upright came against the rounded edge of the cross-piece, it would result in a very clumsy, unworkmanlike joint, and it would be far better to leave the frame plain than to do this. It will be necessary to mitre the bead, and cut it away in those places where the uprights join the cross-pieces. Fig. 6 will make this clear. To do this nicely will require great care, especially in the setting out, or marking the work; but if you mark in the first instance from centre to centre of the upright bars, you should not have much difficulty in afterwards setting out the position of the mortise holes and mitres.

If you do not care about the job, and yet don't want to have the frame quite plain, you might cut stop chamfers round each of the panels, you can then frame up in the usual manner, as the edge where the joints come will not be interfered with.

In the opinion of some, it might look better if the top were a little heavier and more substantial looking, as the pattern given in Fig. 3 may be thought rather slight for a very long blind. To meet this objection, I have given an alternative method of finishing the top, as shown in Fig. 4. This consists in fitting the piece C on to the top of the framework. To prepare it, square up a piece of wood 1 inch wide, $\frac{5}{8}$ inch thick, and the length of the frame; on the under side plough a groove $\frac{5}{8}$ inch wide, and $\frac{1}{4}$ inch deep; then round the edges with the $\frac{1}{2}$ inch beading plane, and glue on as shown, the top of the framework fitting into the groove.

Now you have the framework all fitted, take it apart again, fit in the panels of fretwork, and glue and clamp up the framework, testing with the square to see that all is right before the glue sets.

As a finish to the woodwork, I should recommend varnish or French polish. Of course, French polish makes a better finish than varnish, if you can use it.

PRACTICAL SCENE-PAINTING FOR AMATEURS.

By HENRY L. BENWELL.

III.—IMPLEMENTS, TOOLS AND MATERIALS USED IN SCENE-PAINTING—BRUSHES, CANVAS AND COLOURS.

IT is now my duty to describe in detail the various implements, brushes, and materials employed in scene-painting, for the artist must have all these at hand, and be fully equipped before he can think of commencing work. I shall first take in hand the brushes, as being one of the most important items; these will be found depicted in the illustrations that accompany this chapter. I give the sizes, number required of each kind, and also an approximate price, this latter consideration varying so, both in quality of goods bought, and the market price of hog-hair, the material from which all GOOD brushes are made.

Fig. 7 is an oval ground brush. Number required —Two No. $\frac{0}{8}$, one No. $\frac{0}{4}$, one No. 1. Price, $\frac{0}{8}$, 3s. 6d.; $\frac{0}{4}$, 3s. 3d.; No. 1, 3s.

Fig. 8 is a scene-painter's tool. These are similar to the ordinary sash tools, the hairs however are longer, being $4\frac{1}{2}$ inches in length. One each Nos. 8, 10 and 12. Two each Nos. 1, 2, 4 and 6. Prices, No. 1, 8d.; 2, 10d.; 3, 1s., 4, 1s. 3d.; 5, 1s. 6d.; 6, 1s. 8d.; 7, 2s. 2d.; 8, 2s. 6d.; 9, 3s. 2d.; 10, 3s. 8d.; 11, 4s.; 12, 4s. 6d. each.

Fig. 9 is a flat hog-hair brush. One each of Nos. 1, 2, 3, 4, 6, 8, 10, 12, 14, 16.

Fig. 10 is a round hog-hair brush. One each Nos. 1, 2, 4, 6, 8, 10, 12. Prices, round or flat, rose coloured polished handles. Nos. 1, 2d.; 2, 2d.; 3, 3d.; 4, 4d.; 5, 5d.; 6, 6d.; 7, 6d.; 8, 7d.; 9, 8d.; 10, 9d.; 11, 10d.; 12, 1s.; 13, 1s. 2d.; 14, 1s. 2d.; 15, 1s. 6d.; 16, 1s. 6d. each.

Fig. 11 is a bevelled lining fitch. These are used for ruling lines with the straight-edge, and will be found to do the work better than any other sort. Prices, $\frac{1}{2}$ inch, 6d.; $\frac{3}{4}$ inch, 8d.; 1 inch, 10d. each.

Quilled or Fine Tools are used also by most scene-painters, they are like small sash tools, but bound in quill, and will do well for fine work, one each

of every other number will be found sufficient. Prices, Nos. 0, 2d.; 1, 2½d.; 2, 2½d.; 3, 3d.; 4, 3½d.; 5, 4d.; 6, 4½d.; 7, 5d.; 8, 5½d.; 9, 6d.; 10, 8d.; 11, 9d.; 12, 10d.

Figs. 12 and 13 are two or one-knot ground distemper brushes for priming the canvas and laying in large masses of colour. I myself always prefer the one-knot brush, but most artists use the two-knot, it is quite a matter of taste. Prices, 2s. 6d., 3s. 6d., 5s. 6d., and 7s. 6d. each, according to quality and size.

Stencil Brushes.—One or two of these will be required when painting interiors or prosceniums. One No. 4, one No. 12, and one No. 24, will perhaps be found handy. Prices, Nos. 4, 4d.; 8, 6d.; 12, 8d.; 16, 10d.; 20, 1s.; 24, 1s. 6d. each.

This concludes the brushes. I have given the retail prices. In small towns, however, they might be found slightly higher. There are a cheaper kind of hog-hair fitches sold with common deal handles—in fact, common brushes can be had of every kind, but they are not made of hog-hair. I should advise anyone who intended doing a lot of scene-painting to have his brushes made to order by Messrs. Hamilton, of 8, *Rose Street, Soho Square.* They should be ordered through the firm from whence the colours are bought.

My readers can tell the genuine article by looking for the words "Semper idem," which is the maker's trade mark. Mr. John Smith, of 117, *Hampstead Road, N.W.*, also makes very good brushes; and another firm of brushmakers is that of Messrs. Dale and Plant, *Smallbrook Street, Birmingham.*

Fig. 14 is a 12-inch palette knife, used for manipulating the colours with. Price 2s. 6d. to 3s. each.

Fig. 15 is an ordinary tin kettle used for melting the size in. Price about 1s. 9d.

Fig. 16 is a tin ladle which is used for taking size out of kettle.

Fig. 17 is an earthenware pan for soaking whiting, Fig. 18 an earthenware pot, and Fig. 19 a tin saucepan for holding and warming the colours. The latter will be found most serviceable. Both are sold very cheap.

Fig. 20 is an easel, about 5 feet high, for holding the model or design of scene about to be painted.

Figs. 21 and 22 are a grindstone and muller. The former a marble slab, about 2 feet square, used for grinding the colours on. It should be mounted on wood and have ledges round three sides to prevent colours running off. In some painting-rooms patent grinding mills are used.

Fig. 23 is charcoal for "drawing in" scene on canvas. It is generally tied firmly on a stick to give a larger range and greater freedom to the hand.

Fig. 24A is a chalk line on reel, and Fig. 24B a "flogger." The latter is used for dusting away charcoal after sketch is completed. It is made with several odd strips of canvas, 2 feet in length, bound tightly on to an old piece of broom-handle, as shown in the illustration.

Fig. 25 shows straightedges, A, 6 feet, B, 4½ feet, and C, 3 feet long. They must be bevelled on one side, as per section, Fig. 26, and may also be marked out in feet and half feet.

Fig. 27 is a wooden palette, 4 feet by 2½ feet. It should have a ledge, 3 inches high, round three sides. On the left hand and at the back are eighteen to twenty divisions or compartments for holding the different colours (see sketch and ground plan). On the right hand generally stand the pots or cans, containing the weak and the strong size. The palette must have three good coats of white oil paint, and after standing for about a week should be well rubbed down with sandpaper. The brushes are generally laid out on the right of palette when being used, to be easy of access.

Fig. 28 is a plan of scene-painter's palette, with pails for size, etc.

Canvas.—This is sold in two widths and several qualities. In width it is 36 inches and 72 inches; the latter is the best, as there is not so many seams required. Unbleached calico may be used for small scenes, and may be had in all widths up to 60 inches. Messrs. B. Burnett and Co., 41 and 42, *King Street, Covent Garden,* supply the best flax canvas at the following prices: 36 inches wide, 6d. per yard; 72 inches wide, 10½d., 11½d., 1s. 0½d., and 1s. 1½d. per yard; profile canvas, 3½d. per yard.

Gold, silver, and coloured foils are sold at the rate of about 6d. per sheet by Messrs. White, of *Bow Street, Covent Garden,* who also supply Dutch metal, frosting, logies, spangles, etc. Most of these articles are employed when painting pantomime and burlesque scenery, and will be described later on.

The following articles will, I think, complete our list of requisites, viz., a sponge, a plumb, bob and line, a two-foot rule, a pair of paperhanger's scissors (price 3s. 6d. and 4s. 6d.), and a pair of wooden compasses, such as are used for black-boards, only larger.

Colours.—Next in importance come the colours, and I think it is necessary to speak of their different qualities and capabilities at some length. I shall name them in the order in which it is convenient to place them on the palette.

Whiting.—The best gilder's whiting only should be used, as it lasts longer, and contains less lime than the common article of domestic use. It is sold in lumps, and when required for painting should be broke up and put into the earthen pan, Fig. 17. Enough water must be added to make a stiff paste, care being taken not to make it a liquid. *The last remark applies to all colours when put into the stock-pots ready for use.* It is used to mix with most of the

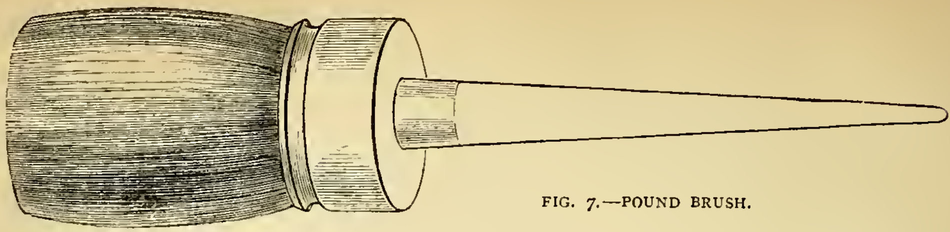


FIG. 7.—POUND BRUSH.

FIG. 8.—NO. 12 SCENE PAINTER'S TOOL.

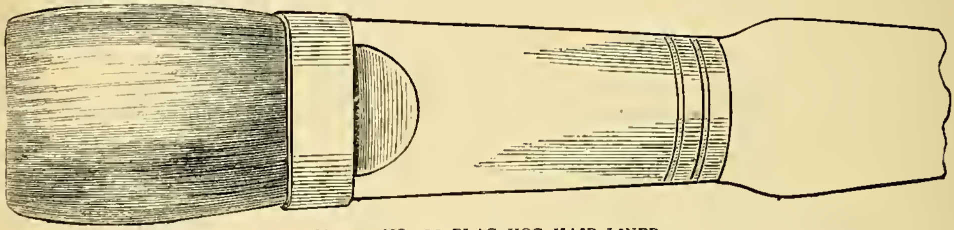


FIG. 9.—NO. 12 FLAG HOG HAIR LINER.

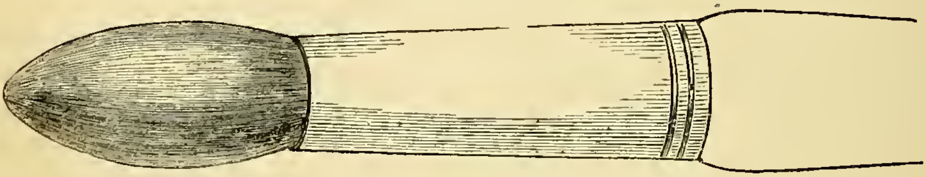


FIG. 10.—NO. 12. ROUND FRENCH TOOL.

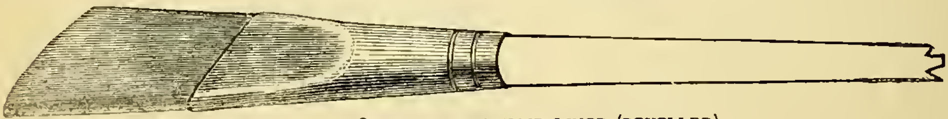


FIG. 11.—NO. 8 FRENCH HOG HAIR LINER (BEVELLED).

FIG. 14.—PALETTE KNIFE.

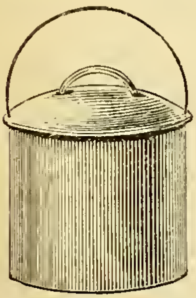


FIG. 15.—SIZE KETTLE.

FIG. 16.—LADLE.

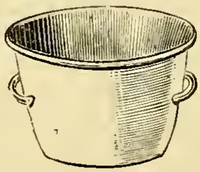


FIG. 17.—EARTHENWARE PAN FOR SOAKING GILDER'S WHITING.

FIG. 18.—PAINT POT.

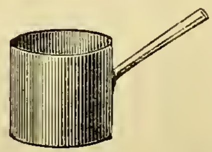


FIG. 19.—PAINT TIN.

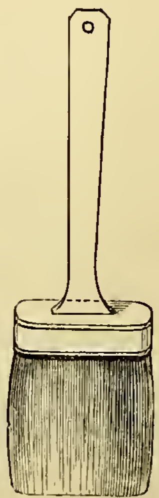


FIG. 12.—DOUBLE OR TWO-TIE BRUSH.

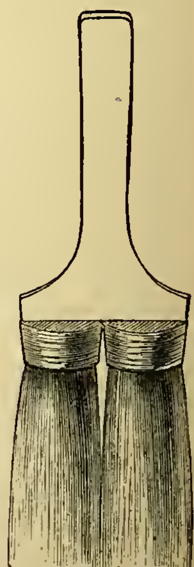


FIG. 13.—ANOTHER FORM OF DOUBLE BRUSH.

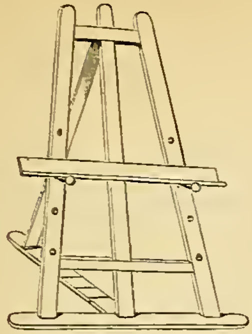


FIG. 20.—EASEL FOR HOLDING MODEL OR DESIGN.

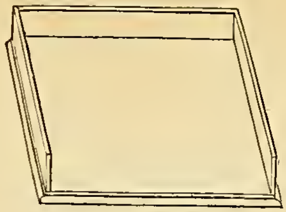


FIG. 21.—MARBLE SLAB.

FIG. 22.—MULLER.

FIG. 23.—CHARCOAL AND STICK FOR TRACING OUTLINES.

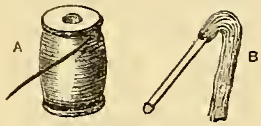


FIG. 24.—CHALK LINE (A) AND FLOGGER (B).

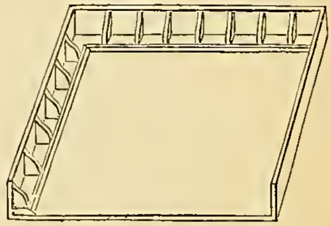


FIG. 27.—SKETCH SHOWING FORM OF SCENE PAINTER'S PALETTE.

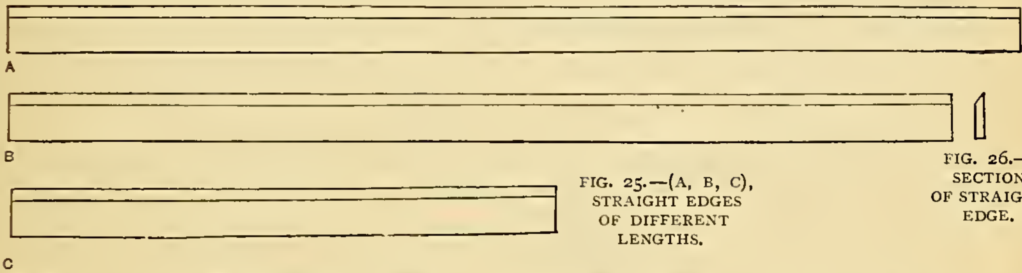


FIG. 25.—(A, B, C), STRAIGHT EDGES OF DIFFERENT LENGTHS.

FIG. 26.—SECTION OF STRAIGHT EDGE.

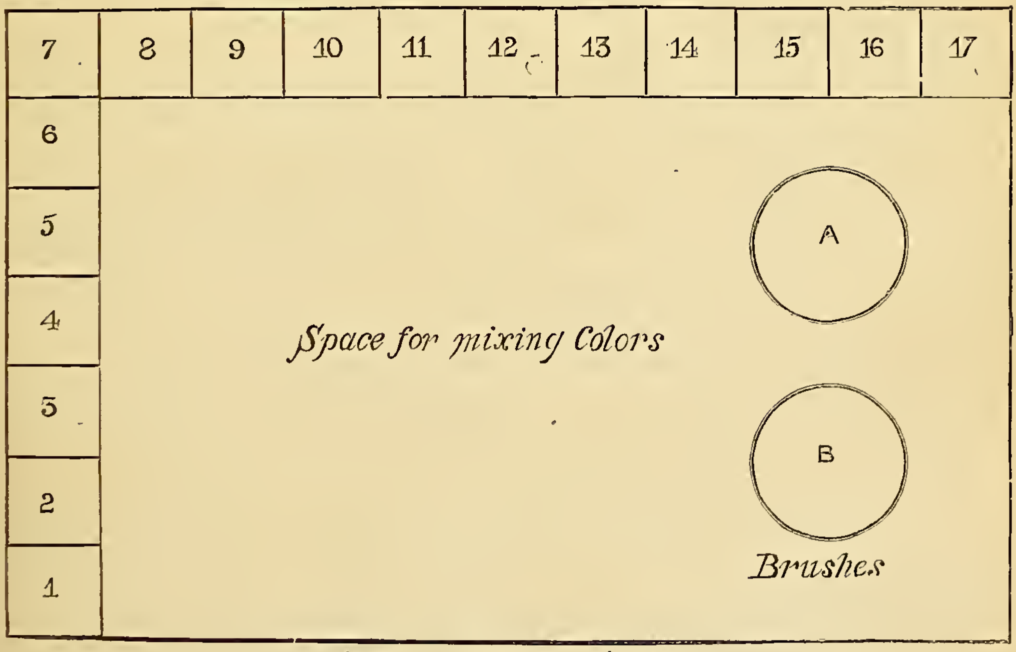


FIG. 28.—PLAN OF SCENE PAINTER'S PALETTE.
A, Tin Pail of Strong Size. B, Tin Pail of Weak or Half-and-half Size.

colours to reduce them, and also to give them greater covering power. Mixed with size, it is known as priming for covering new canvas with. The pan containing the whiting should stand on the table to the left of the palette.

1. *Flake White.*—A fine solid white, apt to turn a brownish colour in the course of time. It is used for extra brightness, and where the highest lights are required. It is sold in lumps, and can be crushed with the palette knife to be fit for use.

2. *Lemon Chrome.*—A brilliant light yellow, largely used in scene-painting. It is sold in soft lumps, and only requires to be crushed in water, as above.

3. *Orange Chrome.*—A rich colour of the same nature as the former, but of a much darker shade.

4. *Golden, or Yellow Ochre.*—This is a most useful and inexpensive colour, and will often be required. It is sold in powder, and only requires the addition of water to be ready for use.

5. *Raw Sienna.*—A rich golden yellow, and is chiefly used for glazing. It is sold in hard lumps, but had better be procured, ready ground, in a state of pulp.

6. *Burnt Sienna.*—A rich glazing colour, also sold in pulp. A small quantity of this should be kept in oil, ready for use. It will be required for painting and shading on gold foil or gold leaf.

7. *Raw Umber.*—A colour often required, also sold in pulp.

8. *Burnt Umber.*—A useful brown, used for glazing purposes. Sold in a pulpy state.

9. *Vandyke Brown.*—A rich dark brown, often used, and a good glazing colour. Sold, ready ground, in water.

10. *Venetian Red.*—A cheap and useful colour, often in request, and has great covering power. Sold in powder, and requires no grinding.

11. *Vermilion.*—A bright red powder; requires no grinding.

12. *Rose Pink.*—One of the most useful colours used in scene-painting, and very cheap. It will be continually required, and is sold in soft lumps. Can be ground on the slab with the help of palette knife or muller.

13. *Damp Lake.*—A deep crimson, and often required. It is sold in a damp state, and should always be kept moist. It is one of the best of glazing colours.

14. *Brown Lake.*—A rich claret-coloured brown, sold in pulp, same as the last. It is rather expensive, so should be used sparingly.

15. *Ultramarine.*—A fine bright blue, sold in powder, and only requires to be plunged in water for use.

16. *Indigo.*—A deep, dark blue, often required, and a good glazing colour. Indigo is extremely hard to grind—it has first to be soaked for several hours in boiling water, and then carefully ground with the muller. It had better be procured ready ground when possible.

17. *Dark Brunswick Green.*—A cheap and useful green, but not of lasting duration or great brightness. For extra good work, such as the painting of prosceniums and act drops, the green lakes, afterwards mentioned, should be used. Sold in powder, and requires no grinding.

18. *Light Brunswick Green.*—Similar to the previous colour, but several shades lighter.

19. *Prussian Blue.*—A beautiful, rich, and powerful blue, now largely used by the leading artists. Requires a lot of grinding, so had better be obtained in pulp.

20. *Drop, Ivory, or Blue Black.*—The first or the last of these three blacks will do for ordinary work, but for anything particular ivory black is recommended. Sold in soft lumps, and easy to grind.

If there are more divisions made to the palette, the following colours can be added with considerable advantage:—

Dark, Medium, and Light Green Lakes.—A most useful green, very powerful and lasting, and of great richness. It is rather expensive, and is sold in jars in a damp or pulpy state.

Mauve Paste.—The same colour as its name implies, and useful for painting draperies and costumes in figure painting.

Dutch Pink.—A most useful *yellow* in distemper painting, and mixes well with any colour. It is much used for the high lights in foliage painting, and is so often required that it ought always to find a place on the palette. It runs rather dear when ground ready for use in a pulp. It can, however, be had in a dry state, and as such, is sold in large round lumps, and requires a lot of grinding with the muller. It mixes well with greens to get different tints and shades.

I have now enumerated all the colours that will most often be in request. There are certain others which the amateur artist may wish to obtain at some time, and some, perhaps, which he will never require. In order to make the list complete, however, I give them below, all of which I have made use of at different times and with different degrees of success. The price of several of these colours is so great that they are seldom used, and even then only in a very sparing manner.

Crimson Lake, Scarlet Lake, and Yellow Lake.—Very rich colours, used mostly for draperies, and sold in pulp. Price, very high.

Carnation Paste.—A useful colour for draperies,

and much used for that purpose. It is a much cheaper colour than the lakes.

Carmine Paste.—A rich crimson, used for draperies and glazing. It is very dear, and does not keep long, being made from animal matter.

Blue Verditer.—A useful blue for night skies and scenes. Sold in powder, but of a sandy nature.

Azure Blue.—A beautiful light blue, very bright and delicate, used for painting a certain class of skies, such as a cloudless summer sky as seen in Italy or Spain.

Damp Blue.—A cheap common blue. Can be used for common work not intended to stand long.

Emerald Green.—A rich, bright green, sold in powder, not often required.

Bronze Green.—A dark sage green, sold in powder.

Dark Brown Ochre.—A cheap and useful brown; should have been mentioned before, as it is used for "putting in" foregrounds and rockwork. It is sold in powder.

Orange Red.—A useful colour, and not dear. Can often be used for heightening the effect in several descriptions of scenes. Sold in a soft powder.

Red Lead.—The ordinary red lead. Can be used instead of vermilion. This is sold in powder, and is very heavy.

Chinese Red.—A deep red, as used in oil for the mail-carts, so everyone should know it. I have often used it with success, instead of some of the more expensive lakes.

Indian Red.—Similar to Venetian red.

Satin Red.—A powder of a very sweet shade of light pink or red.

Crimson Red.—Another red, sold in powder.

Spanish Brown.—A good and useful red brown, of an earthy nature. It has wonderful covering powers, is very cheap, and is sold in powder.

These are about all the colours that can be used in distemper painting. The Americans, however, make use of several others, which are entirely unknown here. Some of these are: Schweinfurter green, Neuwieder green, silver white, Bremen blue, Solferino, Munich lake, Florentine lake, and Vienna lake. In fact, scene-painting has become so important an art in New York, that one large firm there makes a speciality of imported material.

Prices of Colours.—I have decided to give the prices of colours as supplied by two separate firms—one carrying on business in London and the other in Birmingham. I do this in order to save those of my readers who live in the Midlands and the north of England the extra expense for carriage entailed by purchasing in the metropolis. I can recommend the goods supplied by both firms, and their prices will not be found to vary to any great extent.

Price List of colours supplied by Messrs. Simpson and Co., *London Road, Southwark, S.E.*:—

	Per lb.
Brunswick Greens	6d. & 8d.
Chrome Greens	9d.
Emerald Green	1s.
Prussian Blue ...	2s. & 3s.
Celestial Blue	6d.
Ultramarines	6d., 1s. & 1s. 6d.
Azure Blue	3s.
Damp Blue	6d.
Blue Verditer	8d.
Indigo	
Chromes...	10d., 1s., & 1s. 3d.
Dutch Pink	6d.
Vermilion	3s.
Chinese Red	9d.
Satin Red	1s. 9d.
Rose Pink	5d.
Venetian Red	2d.
Orange Red	4d.
Crimson Red...	3s.
Golden Ochre	2d.
Brown Ochre...	2d.

	Per lb
Spanish Brown	1d.
Blue Black	2d.
Flake White...	6d.
Crimson Lake	32s.
Scarlet ,, ...	30s.
Yellow ,, ...	16s.
Green ,, ...	5s. & 6s.
Brown ,, ...	8s.
Damp ,, ...	2s.
Carnation Paste	5s.
Mauve ,, ...	2s.
Raw Sienna	8d.
Burnt ,, ...	10d.
Umbers	6d.
Vandyke Brown	10d.
	Per oz.
Bronzes, Gold, Silver, and Copper	1s. 6d.
Carmine Paste ...	8s. & 10s.
Patent Size, 5s. per firkin, or 16s. per cwt.	

(*To be continued.*)

HELP FOR STRUGGLING AMATEURS.

By PITCHPINE.

III.—TESTS FOR SECOND-HAND TOOLS—REPAIRS.

THERE is an old saying that "Well begun is half done," which, I think, we may apply to our work, so far as it has gone, with some amount of self congratulation.

Let us just take a glance at how we stand now, and take stock of our possessions. First of all, we have a bench, a source of great satisfaction, as you would readily admit if you ever tried working without one. Then, as to tools, we have a hand-saw, a jack-plane, a square, and a screwdriver, and the lot has cost us about twenty shillings. These, with the addition of a hammer, are sufficient for many a job of rough carpentry, although there are several others that may be classed as indispensable tools, and therefore should be the first towards the possession of which your efforts should be directed.

As to the hammer. If you are going to make one do duty for all work, as you easily may, get one weighing about three-quarters of a pound, the shape known as a joiner's hammer. You should have no difficulty at all in picking one up second-hand, in fair condition, for one shilling. See that the head is firmly fixed on the handle; if not, take the head off, and if the end of handle is much worn or knocked about, cut off about half an inch, or less if it will suffice. Then make a saw cut across the end, about $\frac{3}{4}$ inch deep, put on the head, insert in the saw-cut the edge of a thinly tapering wedge of hard wood, drive it well home with another hammer, which you may borrow for the occasion, and cut off any portion that projects. This will

fasten the head in a thorough and workmanlike manner, as firmly as it was at first. In buying a second-hand hammer, however, there is a point to be noticed of greater importance than this. When the tool has been in use for a long time the face, which should be quite flat, becomes rounded, and when in this condition is liable to glance off the head of the nail that you are driving, and make an ugly dent in your work, or an uglier bruise on hand or fingers. If, therefore, the hammer you select is not tolerably flat on the face, discard it, and prefer to pay a little more for one that is in better condition.

FIG. 4.—BEST ANGLE FOR TEETH OF SAW FOR GENERAL WORK.

It occurs to me that it would be as well to say a word or two of warning as to the selection of the tools previously mentioned, lest you should be saddled with some worn-out specimens of their kind, and afterwards think that in following my advice you have been "penny wise and pound foolish."

In selecting your hand-saw you want one that will be suitable for "ripping" and "cross-cutting"; that is, for cutting planks and boards both across the grain, and also in the direction of the fibres or grain. For this purpose you choose one having four or four-and-a-half teeth to the inch, and there are two points to be looked to before completing the purchase. The first and most important is to see that it is not "buckled" or twisted, either in the direction of its length or width. To test this, hold the handle in the right hand, with the narrow end of the saw away from the eye, and look alternately down each side of the blade in a longitudinal direction, and notice if there is any crookedness or "buckle" lengthwise; if none exist, it is all right so far. Then hold it upright, with the handle down, and look across the width of the blade to detect if there is any "buckle" in that direction. The filing and set of the teeth are matters of secondary importance, since it is almost sure to require filing and setting before use, and if you explain to the man to whom you intrust this work, the purpose for which you require the saw, he should know the best angle and set to give to the teeth; the best form where one saw is kept for general work being as shown in Fig. 4 while the set should be moderate—not too much, or it will be difficult to cut with the grain, nor yet too little, or the saw will clog when cutting across the grain. Give a look to the handle, and see that the blade has not worked loose in it. If the saw is right in all these respects you may pay down the money and take possession.

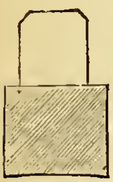


FIG. 5.—HOLLOW IN SOLE OF WORN JACK PLANE.

The chief point to notice in buying a second-hand jack-plane is that the sole is true. After being in use for some time a plane will often become "winding" or twisted in the direction of its length. The twist may be so slight that only a practised eye could detect it, but it is often there nevertheless. The face, too, in course of time, becomes either hollow (see Fig. 5) or rounded, according as it has been used most for long and wide stuff, or for short and narrow pieces. To test this, place a straight-edge across the bottom of the plane, and if the light shows very distinctly underneath it, the face requires "shooting' before the plane can be used for very exact work, so you had better try another. You will occasionally see a piece of wood let into the sole in front of the mouth or opening through which the edge of the cutting-iron projects. This is in consequence of repeated "shootings" having worn down the plane, and so caused the mouth to become so wide that the piece of wood had to be let in to reduce it to its original width. This need not condemn the plane, although it should have some effect in reducing the price.

It does not require much discernment to know if the other two tools are in good order. The screwdriver should be firm in the handle, and not bent, as it sometimes is by being used for forcing off the lids of boxes, or for some other purpose for which it was not intended.

I find, after all, that I shall not be able to say all I wished to do in this chapter without extending it to a length that would incur the wrath of those who think these minor matters a waste of valuable space. I must, therefore, defer what other remarks I have to offer until another occasion.

(*To be continued.*)

LATHE CHUCKS FOR AMATEURS.

By F. J. DURRANCE.

III.—USEFUL DRILL CHUCK, TABLE, AND HOLDER.

IN making the various models, apparatus, etc., in the construction of which the amateur mechanic spends many happy hours, the operation which he is most often called on to perform is the drilling and boring of holes in the various parts, for the purpose of bolting together, etc. It is, therefore, necessary that his tools for this purpose be as perfect as possible. There is an almost endless variety of drilling machines in the market, most of them out of the reach of the ordinary amateur. But if he only has his lathe, he can afford to dispense with all other machines, and rely on this one alone, both for large and small work.

I will explain the method I use myself with great success. The first thing required is a drilling-table, or rest, to fasten or hold the work to which is about to be operated upon. This is fastened to the poppit barrel, and by turning the hand-wheel the work can be advanced or "fed" up to the drill. I will describe this first.

rod of iron, and brazing or soldering the edges together. The ends of this tube must be filed perfectly square, more especially one end. To make a perfect job it would be best faced up on the lathe to do this. Screw a bit of wood on to chuck, Fig. 14, turn it down until the piece of tube goes on a tight fit; then with a graver face up the end: it will now be perfectly true.

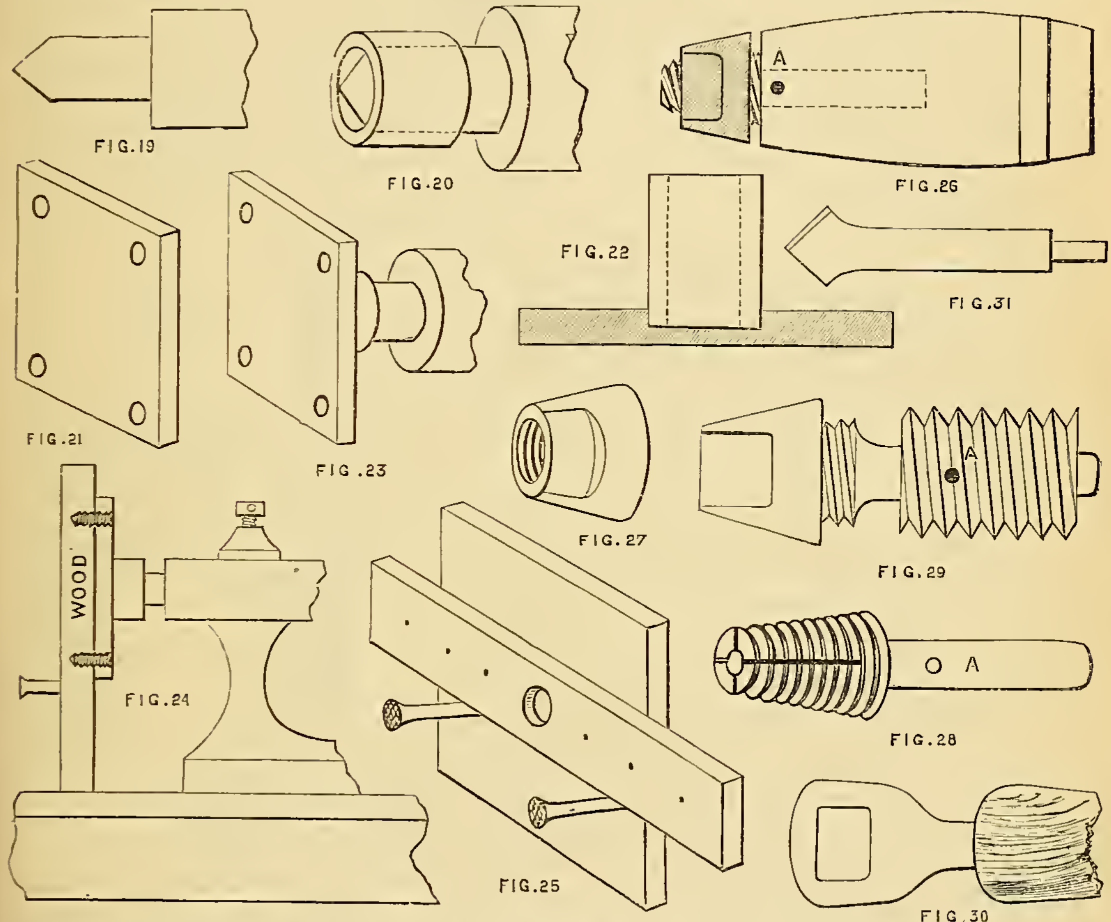


FIG. 19.—DEAD CENTRE AND POPPIT BARREL. FIG. 20.—BRASS TUBE ON POPPIT BARREL. FIG. 21.—BRASS PLATE. FIG. 22.—CROSS SECTION OF TUBE IN BRASS PLATE. FIG. 23.—DRILLING TABLE, COMPLETE, IN POSITION. FIG. 24.—ELEVATION OF LATHE BED AND DRILLING TABLE WITH WOOD ATTACHED. FIG. 25.—SKETCH SHOWING METHOD OF DRILLING STRIP OF METAL. FIG. 26.—HANDLE COMPLETE, AS PURCHASED. FIG. 27.—SCREW CAP FOR TIGHTENING UP CHUCK. FIG. 28.—DRILL HOLDER DIVIDED BY SAW CUTS. FIG. 29.—ELEVATION OF FINISHED DRILL CHUCK. FIG. 30.—END OF HANDLE FOR TIGHTENING CHUCK. FIG. 31.—DRILL WITH REDUCED END.

We will suppose the poppit barrel is $\frac{3}{4}$ inch diameter, see Fig. 19 (if it has a removable dead centre, take it out whilst drilling; the drill will not then touch the centre, thereby spoiling it). If the centre is part of the barrel, you must always be careful not to let the drill-point go through, and strike the end. Obtain a piece of brass tubing, about 1 inch long, and a tight fit on end of barrel (Fig. 20), or make a piece by bending a sheet of brass round a

Next obtain a piece of plate (Fig. 21), iron, or, better still, brass (either round or square)—an old piece of door-plate is just the thing—make it perfectly flat, drill four holes in the corners. Next, fasten a flat piece of wood on to lathe, as before, face it down flat, screw on brass plate, and turn it down flat with a scraper. Unscrew it, and reverse, fastening it on as before. Now turn a recess half way through the plate, just to take the piece of tube an easy fit (see Fig. 22). The

true edge of tube must now be tinned (soldered), as before described, also the edges of recess of plate. Now make all hot. When solder melts, slip tube into recess, and let all cool. Be careful that tube beds firmly on the bottom of recess.

Now slip the drilling-rest on to poppit (Fig. 23). Get a piece of flat wood, about ½ inch thick, and screw it on to drilling-rest, with short screws, from the *back* of plate. Let the bottom end of piece of wood rest lightly on lathe bed; this will prevent the "rest" from turning round as it is moved in or out. This could be also accomplished by having a short screw through brass tube, and screwing it on to poppit barrel. I will just give the reader one example of the use of this arrangement.

We will suppose he has twenty holes to drill in a strip of metal an inch wide, and to be exactly in the centre. Having trued up strip, and marked off the distance, with a centre punch, mark one hole carefully. Lay the strip against the rest, screw up poppit, until the drill-point just touches strip—which must be moved until dotted hole comes opposite drill-point. Now drive into the wood a couple of small French nails, or thick needles. The strip can now be moved along nails, and every hole *must* be in the centre (see Fig. 24). It is astonishing how easy it is to drill holes by the aid of this rest.

I will now describe a splendid drill-holder, which can be made for about tenpence. Every shop supplying shoemaker's tools keeps what is known as a patent pegging-tool (see Fig. 25); this is really a small four jaw chuck—price about eightpence or tenpence. Having obtained this, knock out the pin, A (Figs. 25 and 28), insert a chisel between steel portions and wood handle; a smart blow will then separate the two, and you have now a piece, or, rather, two pieces, like Figs. 26 and 27, shown separately. To fit this to lathe, make a chuck-piece as before. Find centre. Drill the hole to fit shank of drill chuck, a tight fit. Mark where the pin-hole will come, and drill a hole through chuck-piece. Having driven into place, insert the pin, and it will prevent it turning round (see Fig. 28, showing all complete). This drill chuck will carry drills up to about an eight, and larger ones by filing down the shank (as in Fig. 30).

I omitted to say that the handle (Fig. 25) which forms part of the patent pegging tool mentioned above should not be thrown away, but carefully consigned for use at some future time to the repository of odds and ends, which every amateur ought to keep.

I was about to describe some other chucks, but I see the subject is being further treated in "Lathe Building," so I will conclude this series, hoping it has given a hint or two to amateur chuck makers.

DECORATIVE CARPENTRY.

By J. W. GLEESON-WHITE.

XI.—SPECIAL TREATMENT OF DRAWING-ROOM—OVERMANTEL.

ALTHOUGH when the last chapter of this series appeared it was, I fear, understood that the fittings of the parlour and kindred rooms were completed, yet an experiment which I have since been able to carry into actual use has proved so very satisfactory that it might be as well to devote an extra chapter to a description of the work and its treatment.

In almost every house until very recent times, and still in some few old fashioned ones, the fine old four-post bedstead of good wood and exact workmanship held its own in spite of the many competitors; but at length it seems to be doomed, and hurried out of existence as quickly as possible. Dealers, as I know, refuse to give five shillings for a complete four poster with its hangings, proving that even the poorest class of buyers will not have the fine old structures at any price. Some years since I felt sure that the good honest turning and carved work in the posts would serve some other purpose, and bought several pairs as chance threw them in my way (the average price being about 3s. 6d. for a pair). Very few bedsteads could boast of more than two turned or decorated posts, the others, hidden as they were by the curtains being usually simple square pieces of wood.

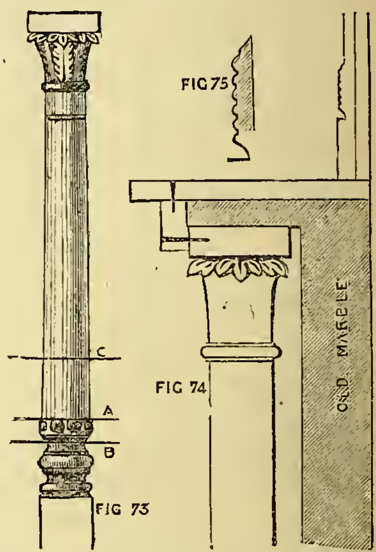


FIG. 73.—TREATMENT OF TURNED BED-POST. FIG. 74.—ATTACHMENT OF PILLAR AND OVERMANTEL. FIG. 75.—SECTION OF FRAMING.

Now that I have found so ready a use for them, almost everyone who has seen the room I am about to describe, confesses to a pang of regret when thinking of the past, and the good joinery more truly "Queen Anne" than nine-tenths of that so called, that they have sold or destroyed, for in most cases if sold, it was either sawn up for firewood or cut up for

small turnings, but there is yet time, I hope, to rescue many fine specimens from so sad a fate; and if sanitary science forbids the revival of their use for their original purpose, there must be better things to be done with them, than the last resource for all that is worthless, burning. Nothing is more common than to find the people who are ready to lament the vandalism and want of taste shown by former generations in destroying fine old furniture, or degrading to out-houses and stables carved chests and woodwork, that in the present art revival would be prized beyond measure; while they themselves are eager to cast away what is at present old fashioned and common, without one thought for the intrinsic merits of the work, or recognition of the fact that the old-fashioned rubbish of to-day becomes in a very few years the much-prized antiques of a future generation. While the so-called Queen Anne and Early English art furniture, often utterly wanting in good taste and honest workmanship, is ousting the solid mahogany cabinet work of the last generation, let us be careful not only to refrain from imitating the folly of a passing fashion in this respect, but take advantage of other people's want of judgment, and buy, for often a mere fraction of the original cost good woodwork of good design, whether it be solid mahogany, rosewood, or any other wood, even if it be at present ignored by fashionable art. For former experience should teach us that in the course of a few years the present despised mahogany, once more sought after and valued, will amply repay the cost and forethought of those who are earliest to recognize the inevitable march of events.

Already brass fenders, tall eight-day clocks, mirrors and Chippendale woodwork, have again come to be valued and eagerly sought after; and among the many objects now despised, the old four-post bedstead will no doubt be once more desirable, if not for its actual purpose still for its good woodwork adaptable to other ends, while the colour of really fine old mahogany will find as many to recognize its beauty as the old oak has done more recently. The theory known as the Darwinian "survival of the fittest" holds good equally as applied to furniture, and the really good will, in the end, overcome any opposition of a passing fashion or craze.

At present the one portion of the bedsteads of the past for which I suggest a new use, is the carved or turned posts, and I feel sure the first experiments (so far as I am aware) proving so successful, that many other modes of treatment may utilise them with still better results, as different tastes and thoughts are brought to bear on the various possibilities of their adaptation.

The room I am about to describe has been worked out, governed by the necessities of the case, and is to be taken, by no means as an ideal treatment, but simply as an instance of a fairly successful example. For I think the actual description of one scheme carried out, is more likely to be useful than a dozen imaginative plans, which may have many obstacles to encounter in actual work.

Having succeeded in getting together some few pairs of bedposts, I determined to make them the principal feature in a room that was about to be re-papered and painted, and to utilize them for the overmantel overdoor, and in other parts of the room.

Had the cost of mahogany and the difficulty of obtaining a sufficient supply of old wood (for I had foolishly bought the posts only) not stood in the way, undoubtedly it would have been better to use the natural wood throughout, but that would also have necessitated either veneering the doors, or new ones of solid mahogany, so that, very much against my wish, I was compelled to decide to paint all the woodwork.

This decision at once gave liberty to use any cheaper woods, and also admitted of lincrusta being utilized for the flat surfaces of panels and friezes, thereby greatly adding to the decorative effect at very small additional cost,—in fact, the whole of the lincrusta used was at most twelve shillings' worth.

The first thing was to make an overmantel, or rather, in this case, to make the mantelpiece itself extend from floor to ceiling; all that was existing there was a plain marble chimney-piece, which for reasons unnecessary to quote, it was decided to retain; for this, as my posts were all sufficiently unlike to use except as distinct pairs, I decided to take the richest pattern for the overmantel, but as two in the round would have been at the same time heavy and yet insufficient, it was found best to cut them lengthwise, and use the four halves mounted on plain wood for pilasters to support a frieze with mouldings, thereby breaking up the space into panels, then another pair below, in the round, were fixed in front of the marble pillars of the old mantel, while on either side shelves were added to increase the width and form, useful places for display of bric-a-brac. The overmantel is shown in Fig. 76.

The actual work was built up from the floor. First a pair of the posts, see Fig. 73, were sawn off at A and B, the post itself cut at C, and the piece of carved work between A and B fixed with nails to the foot; plain square bases with moulding, were nailed to the floor, upon these the posts were fitted under the marble shelf, which itself carried a board of inch deal extending at each end over the old shelf to the required length, and projecting some three inches over the marble in front, and kept in place at the back by the upper part, to be described presently. In front it was secured by pieces of wood (as shown at Fig. 74), which, being screwed both to the board and the posts

kept all firm and solid. I have described this as fully as I could, as one of the principal difficulties in working with a stone mantel is to secure a firm fixture, for it is evident that it is not possible in an ordinary way to fix any part of the wood to the marble itself.

At either end of the work some eight inches clear of the marble uprights, posts standing out equally with the marble, and about three inches wide, were fixed to the floor and to the mantel board; the skirting of the bases of the pillars was made good along the floor, both in front and at the sides; and the frieze of the marble was carried on in wood, fixed under the mantel board, shelves being added in the space as shown, the actual fixing being to a false back of wood,

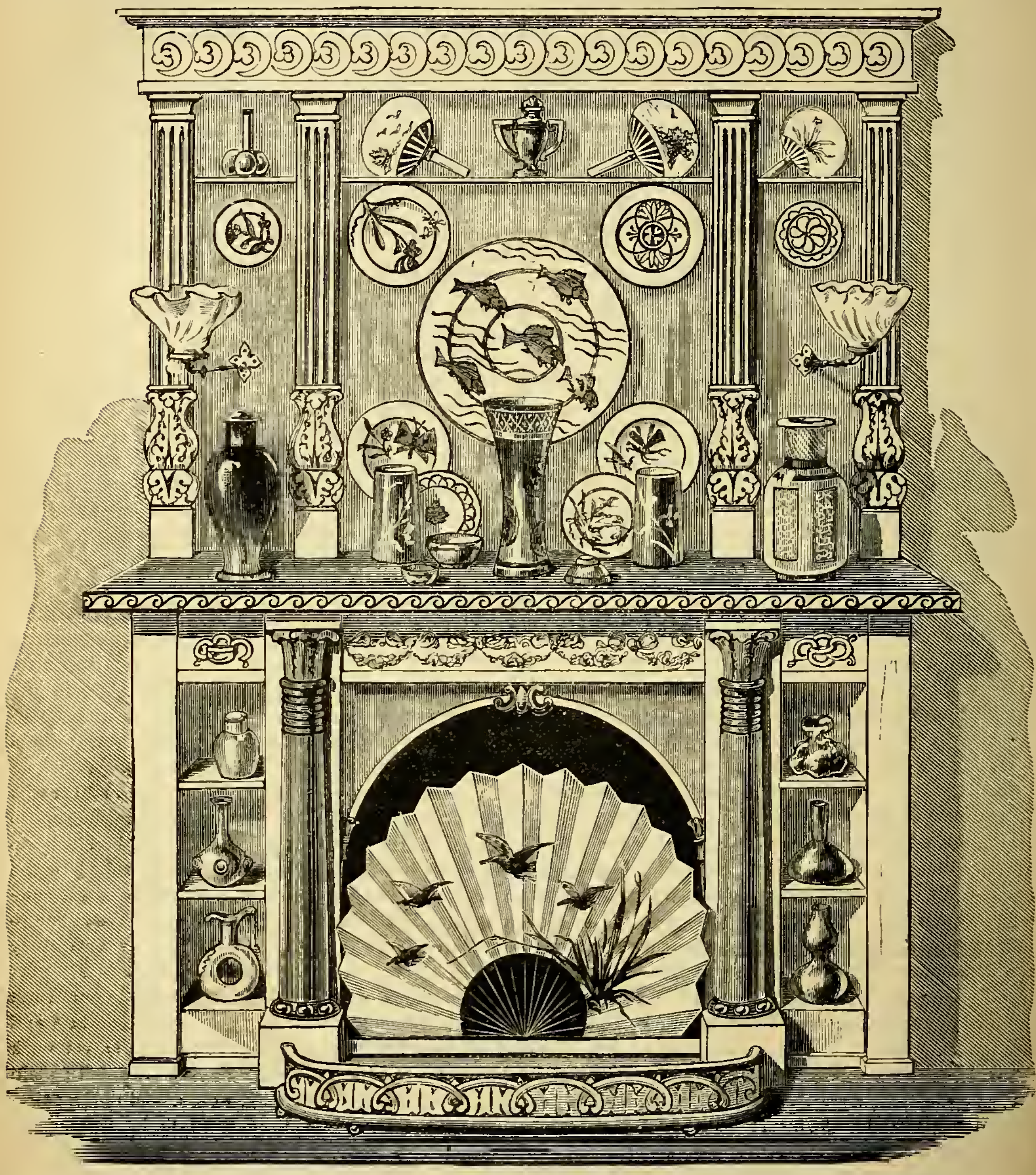


FIG. 76.—EXAMPLE OF OVERMANTEL FOR DRAWING-ROOM WITH MANTELSHELF SUPPORTED ON PILLARS.

and the post, sufficient to keep so small a shelf firm, as it seemed unnecessary to cement bearings to each little shelf on to the marble or to carry up a thin piece of wood to mask the marble; but that would be the more lasting way perhaps to work out this portion. This completes the woodwork of the lower portion.

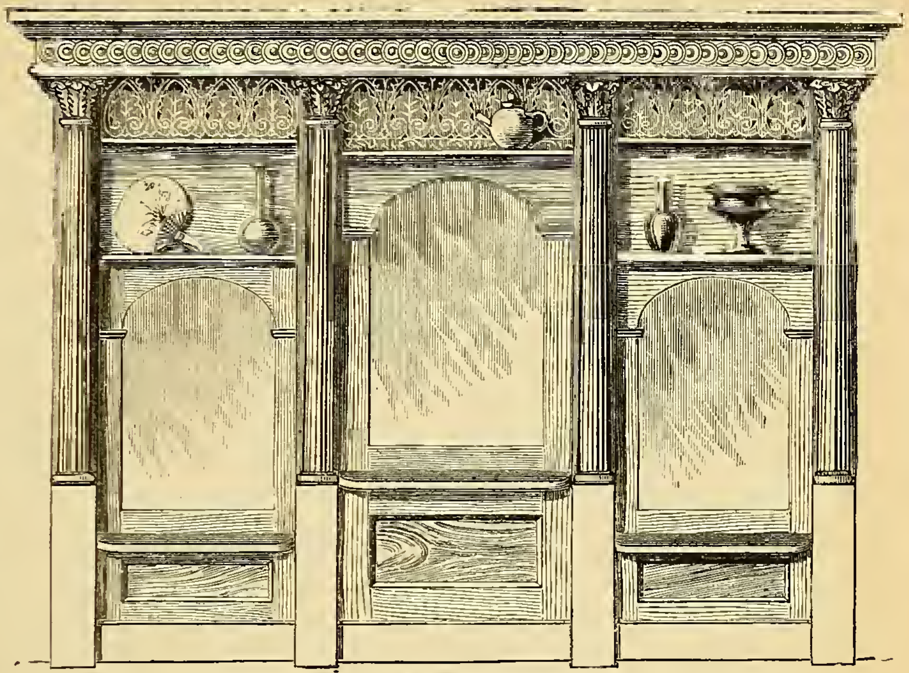


FIG. 77.—ALTERNATIVE OVERMANTEL FOR DRAWING-ROOM, WITH PANELS, ETC.

Above the board the work was much more easy, the carved pilasters being cut with about 4 inches of the square base below the turned work. Flat pieces of deal an inch thick, and the exact width of base, were nailed to the wall, one at either end, in line with outside lower posts, and one in line with each round post that had been added below. Between these, flat to the wall, a piece of inch deal was fixed, about 6 inches wide at the lower part, and another piece across the spaces between the pilasters at the top about 4 inches clear of the frieze. For the top portions, a piece of woodwork moulding on edge, just overlapping the posts at each end, and about 4 inches wide, was screwed to the ceiling, a shelf of plain square wood being fixed on the top of the pilasters, and space between filled with what is known in other places as a fascia board to carry lincrusta frieze; a small shelf may be added, as shown in sketch below the frieze.

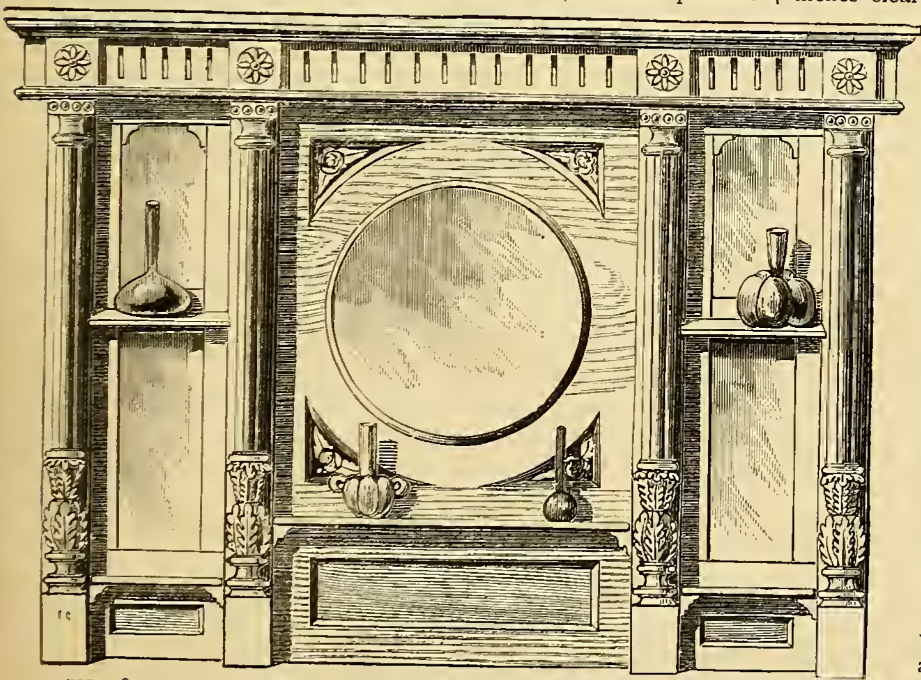


FIG. 78.—ALTERNATIVE OVERMANTEL FOR DRAWING-ROOM, WITH CIRCULAR MIRROR.

Having got the woodwork fixed, and a coat of paint (in this case a grey

black) being given to the whole, a wide lincrusta border of about 4 to 5 inches was glued on the marble, and corresponding pieces of wood below the shelf. The shelf itself, not being moulded, or, still better, carved at the edge, was finished with a piece of lincrusta one inch wide, while the frieze at top carries a border to fill the space left. The spaces of panels, if desired to hold mirrors, may be treated as sketched in Fig. 78; but in the room described they are fitted with a dull terra cotta granulated material 32 inches wide, costing 1s. per yard, sold by Messrs. Liberty. Of course, plush would be preferable, if the cost were no objection. It is evident that many variations must be introduced to adapt such a design as this to other rooms; if the room is high, the top piece will serve as shelf, in place of being fixed to the ceiling; and if the posts have capitals, each part of frieze may be broken by a square block to emphasize the pilasters. If desired, brackets may be introduced to carry china, but I think that simple shelves, covered with the material used for the panels, and kept as subordinate as possible, would break the design less than shelves more boldly treated. In Fig. 78 a sketch shows the style of filling that might be adopted if looking-glass was required, the spaces between the pilasters being filled with panelled framework of wood holding bevelled plates of silvered glass.

(*To be continued.*)

FISHING TACKLE:

ITS MATERIALS AND MANUFACTURE.

By J. HARRINGTON KEENE.

IV.—TACKLE FOR THE CARP FAMILY.

ALL the "summer spawners" but eels, pike, perch, and ruff, are more or less members of the great *Cyprinidæ*, or carp family. Roach, dace, tench, carp, barbel, chub, all are of this latter category, and I purpose in this paper to briefly describe and tell my readers how to construct the various items of tackle necessary to their capture. Of course, a great many of the appliances are convertible, with such exceptions as will be pointed out. Difference of size and quality of material being only in existence in certain cases, I trust there will be nothing which in light of the previous chapters of this series will be anything but lucid and plain.

First, then, I will refer to the *line for roach fishing. Par parenthèse*, let me at the onset say that this heading refers to the bottom line only. The rod and reel line is a separate matter, and should be of light and elegant make—sufficiently so in any case to be in proportion with the finest of gut. One word as to the gut before passing on. For a roach line this must be of the finest and roundest, though of course this is not so absolutely necessary as for fly-lines.

Now of what does this line consist? Three yards of joined gut (so selected that it tapers towards the hook) of a float, split shot, and hook. As to the hook. The size I prefer is shown in page 9, No. 36, Fig. 8, and it must be slipped on to a length of gut. To do this carefully, select the gut and roll it round your fingers into a hank about as large as half-a-crown, leaving one end out perhaps an inch and a half. When it is rolled it is not in your way. Take the free end, and either crush it for a short distance in your teeth, or burn off the end in a candle. This proceeding has the virtue of rendering the binding more secure. Now take the hook between the left finger and thumb, with the round of the bend between them, and place the gut under the shank up to opposite the barb; hold this tightly. You have previously waxed your silk, which is fine and strong, and you now take one end also between finger and thumb of the left hand, and commence and go on winding evenly and with steady tension from end to bend. You now without removing finger and thumb, take one turn round the aforesaid finger, and pass the gut through, form a single one of the cloven hitches, shown Fig. 23, page 81. Draw this from the finger to the shank and tightly, and you can now with safety add another. Clip off the loose end of silk, there must be no gut or other loose end showing, and your hook is whipped, as it is termed. Too much wax must not be used, as the varnish does not take well. The binding must now be touched sparingly with shellac varnish (dissolved shellac in spirits of wine, with a little gum benzoin added), and placed in the sun, or near a fire, not too close, of course.

You will, if you are wise, make a dozen or more roach lines at a sitting, and we will assume that a dozen hooks will therefore be tied. My plan is to take one evening for hook tying, *pur et simple*, others for float-making, line-tying, plummet-making, etc.; and if this is done it is curious how the mechanism of the hand seems to fall naturally to its task. In such case, a slender rack made of a thin rod of iron stretched between two uprights is very useful for the drying of the varnished hooks, because they can be arranged so as not to touch. This will be found especially useful when one is making jack and other tackle.

Supposing the hook dry, the next thing is to loop the other end of the gut. Now if this is whipped and not tied, it will be found to be a rather ticklish job, and the learner will be some time before he can whip the loop with a certainty of exemption from accident

in the sbape of its being insecure, or the finish off coming undone, or the gut drawing. This latter, I need scarcely say, is an unpardonable fault in the tackle-maker. Better be coarse and strong than neat and weak. However, the left finger and thumb comes into play, and the operation is performed towards the loop, finishing off on *one* of the seams of gut. The finest of fly-tying silk is here indispensable. In fact, it may be said once and for all, that the strongest work is performed with very fine silk always. It takes longer, perhaps, but tbis quality and its neatness are recompences.

If, on the other hand, tbis loop is tied, and I frankly say that I prefer it tied, it should be done so with the loop given either at Fig. 29, page 81, which I prefer for roach tackle, or that shown at Fig. 30, page 81. Soaking is, of course, necessary.

The next consideration is the line itself. This I prefer tied only, but the fashionable way is to tie with either Fig. 27, or Fig. 28, and whip the bare ends for a short distance for greater security, when each strand of gut sbould be straigbt, and the rough ends always cut off quite free from the round part. It is a good plan to soak after tying the requisite lengtb—three yards, and stretch the gut with a steady pull from a round hook let in your work bench. Of course loops are tied at each end, either as at Fig. 29 or 30, page 81.

Tbese two preliminary processes—hook tying and line making—are the same for all fish, with the simple difference of size in hook, and shape and coarseness of gut. These will be adverted to as we go along.

The float is made in a great variety of shapes, and I shall digress here to speak at full on its amateur manufacture. Floats are also made of a great variety of materials, the chief of which, however, are cork, quill, reed, and wood. Fig. 41 sbows tbe principle of the float in its most primitive form.

A is the barrel of cork, painted in two colours, as indicated by the line; B is a length of wood tbrough its centre; C C, the rings of brass through which the line passes to be retained in its place by the cap just above B.

Now this is the cheapest mode, and I need scarcely tell anyone with a taste for mechanical pursuits, how it is to be done. At Messrs. Allcock's factory at Redditcb it is a pretty sight to see how all sorts and conditions of floats are manufactured. Literally thousands are turned out per week, and yet the demand seems inexhaustible. With them the cork-cutter sits at his bencb, and by his side you see a heap of square pieces of cork of all lengths and sizes, from that of the tiny dace float to the big jack, duck-egg like appliance. True, he picks up each piece, and fixing it in the latbe with the rapidity of tbought almost, he has applied a chisel-like tool, and the shavings run off in a shower. The barrel of the float is formed and pitched aside. Next, the cavities, unavoidable in nearly all cork, are filled up with putty, and when this is somewhat hardened the cork is again placed in a lathe, and as it is whirled round tbe surface is sand-papered smooth. Next it is bored, and the plug B, Fig. 41, fitted. Next the rings are added and whipped neatly in their places. Finally, the float is painted and varnished.

For home manufacture I have made use of good wine corks with advantage, boring them through with a cork borer, to be had of all chemical apparatus makers, and fitting two or more corks accurately one on the other, with a little stiff shellac varnish between them, to render them firmer one with the other. With such a float as this I use a good stiff swan or goose quill as a plug. The cork can be cut with a sharp knife roughly into shape, and afterwards rasped with a sharp-wood rasp more truly, and then sand-papered. After this it may be puttied, and the finishing touches added, as in Fig. 41.

A large quill of turkey, pelican, or swan, or even smaller ones of goose are by no means bad roach floats, if made as follows: Take the quill and carefully scrape it to remove any attached skin; then remove the feathers right down to the quill. Just where this joins the quill there is a tender spot, and if you pull the feather too roughly you will do away with its being waterproof, and the float is not of much value if not waterproof. Carefully, therefore, remove the feather and take your whipping silk and bind this spot on the quill firmly and evenly, waxing the silk rather more than usual. Now apply the shellac varnish rather copiously, and let it dry; give it another coat, taking care that the former hardens ere the latter is applied. Now take a piece of fine copper, tin, or brass wire—the latter for preference—and wind it round a hair-pin or fine knitting-needle once or twice, turning the ends at right angles. You have thus a ring which is to be attached to the upper part of the float at about half an inch from its end, whip it firmly and varnish. Similarly attach another to the lower end. Now tip each end with a little sealing-wax varnish; red is usually employed as being a conspicuous colour. This varnish is made with the best red sealing-wax broken into chips, in spirits of wine; let it stand in a warm place—not too warm, till required. Your roach float is now made.

Sometimes in order to avoid the nuisance of having to undo your bottom line from the running line in order to change the float should it be too heavy, another dodge is resorted to, which, however, is only applicable to cork floats. The cork is split through the barrel and the line is drawn into this until it reaches

the centre core, it is then drawn round and away from the slip, so that it cannot return out of the latter unless moved to it again. This is a capital invention for jack floats.

I am also in favour of what is termed a self-cocking float for certain sorts of fishing, especially that for carp and roach. This is simply formed by placing a cylindrical piece of lead, easily cut from a hank of lead wire, into the lower part of the quill, and whipping neatly round it. The binding of the lower ring will do capitally for this purpose indeed. Of course, the weight is proportioned to the natural buoyancy of the quill, and the float ought not to sink lower than will leave out quite an inch in a small and an inch and a half in a large float. This self-cocking arrangement obviates the use of split shot on the line—to which we must get back by-the-bye. It is chiefly suitable in still water, such as lakes and canals, where the fish are exceptionally shy.

Split shots are used of narrow sizes, and are split, I need scarcely say, with a special machine like a pair of tweezers. These can be purchased from a tackle maker, and I need further say but little about them, as it is scarcely likely that the amateur will split his own shot when they are so ridiculously cheap.

The shot should be pressed on our roach line by means of a pair of ordinary tweezers. If the expense is an object the teeth will do as well—providing, of course, you have some in front. The shots ought not to be nearer than a foot from the hook; if the hook gut is longer than a foot a small one may be placed on it. I always use No. 4 shot myself. A piece of lead wire is wound round the line by some anglers, and they claim that the gut is then not injured by compression, and that it can be easily taken off. This is a good argument, but isn't it likely the fish will sooner see the wire than the shots?

You have now finished your roach line. The same sort of thing with a lighter float will do for dace and bleak. For tench and carp even lighter floats are used, and finer gut; the hook somewhat larger. For chub, a small triangle hook is often used instead of the single.

One or two little appliances are yet necessary to complete the tackle of the roach, dace, bleak, tench, and carp fisher. Having made his lines, a winder is *de rigueur*, whereon he may place his tackle when not in use. This, of course, varies from the half section of a bamboo cane to an ordinary piece of board simply notched out. Fig. 42, however, is *the* thing, and the following is a description: A, A, A, A, are slips of this wood, held at distances of half an inch or more by a brass wire; B is the lid made to slip off a box in the centre of the winder into which the brass wires are fixed. At intervals, up the sides of the winder on the slips A notches are cut. The hook of the line is slipped on the wire of either partition, and the line is then wound round and round until its end loop is secured in one of the notches. Of course it is obvious that this protects the angler from the hook and the line from entanglement. The material is commonly boxwood.

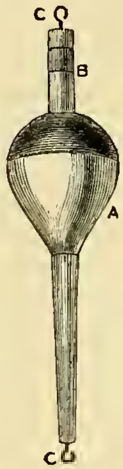


FIG. 41.—PRIMITIVE FORM OF FLOAT.

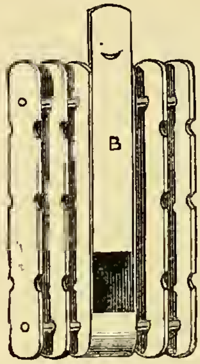


FIG. 42.—WINDER FOR LINE FOR ROACH TACKLE, ETC.

FIG. 43.—LEAD.

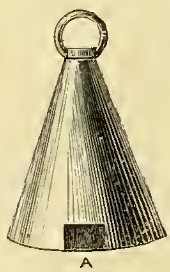


FIG. 44.—ALTERNATIVE FORM OF LEAD.

The plummet is a necessary adjunct for roach, etc., fishing. Figs. 43 and 44 show two patterns, both of lead. At A in each a core of cork is placed, and there should be no difficulty in fitting it, inasmuch as that the cork can be softened very much by immersing in a little hot water. Both are of otherwise solid lead, with a brass loop let in, one square and the other rounded and pyramidal. I make a mould of chalk for my plummets, and if they come out rough they are easily filed into shape. They should be painted a dullish green, and never be left bright, unless you some day want your hook and plummet to disappear from off the gut by reason of the rush and bite of a voracious perch or pike. I have known a pike to snap off my plummet before now because of its brightness.

Barbel are certainly taken with the float and line, but the whole arrangement is almost double in size and general coarseness. There is a very favourite method of taking these fish with some fishermen, and that is by an arrangement termed a "leger." The bottom trace, which is used for this, consists of a yard of fairly stout gut, joined as before directed, and between the last two links a piece of gimp is joined by whipping. Now at the end of this gimp farthest from the hook, a large split or drilled shot is placed. A bullet is slipped on from the shortest end and is stayed by the shot. This leger is attached to the rod-line, and baited with

a worm and thrown out, so that the whole arrangement lies on the hottom. When the fish bites, it of course jogs the line without much moving the bullet, because this being drilled allows of the free passage of the line. It is a very deadly piece of tackle.

There are one or two miscellaneous articles I might as well enumerate here as being useful, and, indeed, some of them indispensable to the angler for *all* fish, not less than those to which I have referred. The first of these is a landing-net. I shall not here dwell on net-making—though at some future period I hope to do so in this Magazine; so I need not refer particularly to the net, except to say that it should he dressed and thoroughly dried. The handle and ring for the net are, however, distinctly within the province of the amateur workman. The handle may be of any light or tough wood, and the iron of it being home-made, may be of hoop iron. I find no difficulty in getting a ring of, say, 12 inches of $\frac{5}{8}$-inch iron or steel, welded together into a spike for fastening in the handle for a few pence, and with an iron collar to prevent splitting; he must be a very poor tool who cannot contrive one. The net is laced on with two half hitches to each mesh, and should be carefully dried after every using. Fig. 45 shows an improved collapsihle whalehone ring, which is in request hy all the "swell" anglers owing to its portahility and general handiness. A and A indicate two joints, which when extended as now shown, are rigid outwards, hut on the release of the holt at B, which is easily done by means of the trigger shown, collapse inwardly, until the whole affair can be folded up in an umbrella case. This fits by means of a screw with broad thread, in a suitable handle.

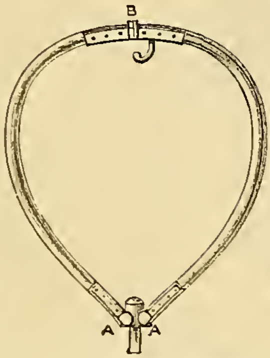


FIG. 45.—COLLAPSIBLE WHALEBONE RING FOR LANDING NET.

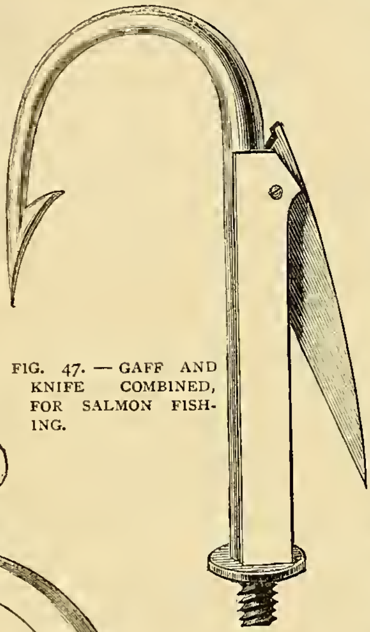


FIG. 47. — GAFF AND KNIFE COMBINED, FOR SALMON FISHING.

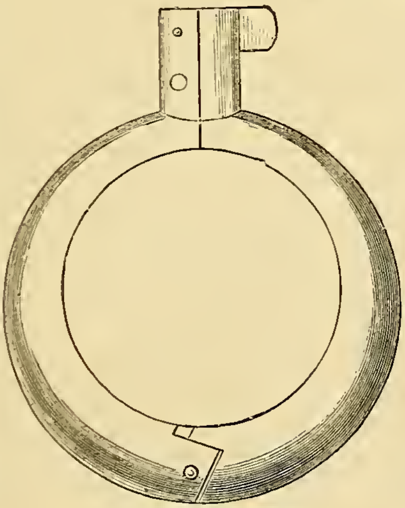


FIG. 49.—CLEARING RING.


FIG. 48. — CLEARING RING FOR CARP FISHING.

Fig. 46 represents, perhaps, the hest kind of collapsihle handle I have ever seen. The holt at A locks this handle when extended, though hy pressure upon it, it can instantly he released. The advantage of a handle which can he extended or contracted at will when fishing, is obvious. The landing-net is used for the purpose of taking the fish out of the water when it has been exhausted hy the angler, and it sometimes happens that it is practically impossihle to reach the exhausted fish with a short-handled net. This handle can he taken in one hand and opened without aid from the other, and can he unlocked again in a similar manner.

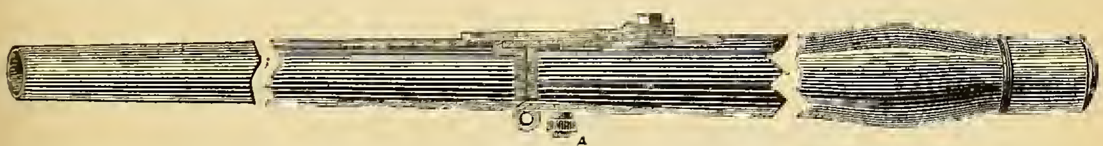


FIG. 46.—GOOD COLLAPSIBLE HANDLE FOR LANDING NET.

Fig. 47 is what is termed a gaff and knife combined, and is very useful for salmon fishing, or even pike fishing, though not perhaps so much so in reference to the carp family. A gaff is a hook with barb used to land fish in the place of a landing-net. The hook is thrust into the gills if possible, or into the belly of the fish, and it is thus lifted bodily out of the water.

I introduce a drawing of this improved form of the gaff, because the knife thereto attached is so useful for cutting off a branch of a tree or weed in which the line may from time to time become imprisoned. It is an article also easily manufactured by any one possessing a forge. The barb is not absolutely necessary; in fact, I prefer the weapon without it. I need scarcely say the knife is a fixture, coming out only a short distance in excess of its position, as shown in the illustration.

A clearing ring is also handy for the carp fisherman. This is a heavy ring of lead enclosed, but with the ends overlapping. When a weed is encountered it is easily slipped on the line and allowed to run down to the hook and on to the reed. Of course a string is attached. Almost any weed will yield to this; Fig. 48 shows it, and it can be made by anyone.

Fig. 49 represents the clearing ring usually sold in the shops. It is made of lead, jointed at its lower part, as shown, and closes to in the upper half. A line is passed through the two holes shown in the engraving and held in the hand. This implement is certainly better in appearance than the rough-and-ready ring shown in Fig. 48, but it is an open question if it be really more useful.

I find that there are many readers of this Magazine who are desirous of learning to make their own rods as well as the other kinds of tackle, and the varied appliances used by fishermen, so as soon as I have finished the present branch of our subject, which will be in another paper, or at the very utmost in two, I shall turn my attention to rod making, and will seek to render my remarks on the various kinds of rods used in fishing and my instructions on the *modus operandi* to be adopted and followed in making them so clear, precise, and minute that no one need fear to fall short of success in making them. And directions for making will of necessity be accompanied with hints and instructions for mending broken joints, and making a good and workmanlike job of the repairs to be taken in hand. No fisherman should go on a fishing expedition which involves absence from home for a few days without being provided with the necessary means and appliances for mending a damaged joint, to be carried out roughly on the field, and afterwards more neatly and effectually when taking his ease at his inn, after the day's work is over. There is no field sport in which a man may be more independent of extraneous help and thoroughly self-reliant than he may be in fishing, and this I fully intend all my readers to be, provided that they are willing to follow my teaching.

(*To be continued.*)

THE POLARISCOPE:

HOW TO MAKE IT AND USE IT.

By O. BECKERLEGGE.

ONE of the most wonderful and beautiful instruments to demonstrate the properties of light is the one we are about to describe. But the first question likely to interest a great number of thoughtful readers is this—what is polarization of light?—an important question, by the way, but not one easily answered. As I have been reminded by the Editor that I must leave theories for the most part to text books and confine myself principally to constructive work, I shall have but little to say on the mere laws of optics, confining myself to illustrating and demonstrating. And here I am reminded of a statement I saw some time ago, that there is but one man in Europe who perfectly understands polarization of light. I do not know who that gifted person is, the only thing I am certain of on the matter is that it is not myself. I have always found the best way to obtain a practical knowledge of a subject is to make experiments. I will therefore show you how to make a simple instrument for demonstrating before proceeding to make the polariscope for the microscope. Furnish yourself with a tube either of tin plate or paper—the latter is the simpler; take a strip of paper—common brown will do—two feet long by six inches wide, carefully and tightly roll it around a broom handle or large ruler, fasten each layer to the next below with hot glue. If tightly rolled and well glued, when it is dry it will be a very firm tube. This first tube will be that shown at A in Fig. 1. Now make another tube, as shown at B, the same length, but which will slip over the first, tightly, yet smoothly. The diameter of the first is immaterial, but we will make it, say, 2 inches in diameter, as that will be a convenient size to work at. One end of each tube must be cut as shown at C and D.

We next want a frame for our mirrors. Take four pieces of wood $\frac{3}{4}$ inch by $\frac{1}{4}$ inch and make an oblong frame $2\frac{1}{2}$ inches by 2 inches, $\frac{3}{4}$ inch deep. This can easily be done, either by mitring and gluing or halving out each end and gluing, screwing them, or by any other means you may choose. When made, glue it to a piece of cardboard, and when dry cut out centre of cardboard so as to leave a rebate, it will now have the appearance of a picture frame—cut, say a dozen pieces of crown glass to fit into the frame. Let me here say you had better cut all you want out of the same sheet, as different kinds of glass have different polarizing angles—place, say six or eight pieces of glass in each frame and fasten them in by any means

you choose. A convenient plan will be to make a couple of small buttons, fix them to frame by small screw. If the glass does not quite fill the frame, pack up with a little wood—say a match; turn around the button and the glass is securely fastened. Two of these frames are to be made—one is the polarizer, the other the analyzer. Make a hole in each projecting end of each tube at C and D. See that the holes are square with the axis of tube. To be sure of this, pass a knitting needle through the holes and see if it is square with the sides of tube. Now somewhere about the centre of the longest side of the frame make a hole on each side, being careful that the holes are quite opposite each other. Place mirror between projecting ends and insert your screws; do this to each tube and the job is finished. The mirror will now swing around and stand at any angle with the tube.

Now for our first experiment: place smaller tube on any suitable stand so as to raise it about a foot from the table with the mirror standing with its plane perpendicular to the horizon. Turn the mirror on its axis until it stands with the tube at an angle of 56°, Fig. 2, B, place some source of light on a level with the mirror and in such a position that the reflected rays shall pass through the axis of the tube. I take for granted that one who would undertake the construction of a polariscope, even in its simplest form, will know the simple law that the angle of reflection is the same as the angle of incidence. As far as we can at present see, the reflected light has undergone no change, but seems in every way to be the same as unreflected light. Such, however, is not the case, as will be shown by the analyzer, which is the term applied to the second tube and mirror.

We will now place this tube on the smaller one with the mirror placed at the same angle as the first. Turn the tube around till the mirror stands with its plane perpendicular to the horizon. We now find that instead of reflecting the light which falls upon it, it seems to quench it, and there is little, if any, reflected. We now slowly turn the larger tube around on the other, as we do so we see the light growing stronger, until we have turned a quarter round. Continuing in the same direction, we find the light growing fainter till we get half way around; when completing the revolution we find the light has two points of brightness and two of darkness. The inference we draw then is this, that a pencil of light has, under certain circumstances its under and upper sides, differently affected to its sides, right and left, or if you will that there are two distinct and opposite conditions or poles—hence it is polarized. Indeed, the ray of light is split in two—one is called the ordinary, the other the extraordinary ray. These two are differently affected. When the two mirrors are in the same plane one ray is a half a wave behind the other, the crest of one fills the hollow of the other, so to speak, hence there is "interference," just as when in tuning a piano one string is a little flatter than the other, there is heard the "beat" for the same reason—one sound wave travels a little faster than the other, so at regular intervals the crest of one wave fills up the hollow of the other when there is silence thus to "beat." Well, light follows similar laws, and when the mirrors are in the same plane there is this "*interference.*" When they come at right angles with each other the waves coincide, and there is light, as the mirror continues to travel around, one wave gets farther and farther behind, until one quenches the other—similarly, I may suggest, to the "beat" in music.

I think we have gone as far in this direction as is necessary to give us an intelligent insight into the nature of the polariscope. There is, however, another point or two which should be understood in another direction which is this—that various reflecting bodies have various polarizing angles. As we have seen glass is about 56°. Now place your mirrors at any other angle you will find that whilst adjusting the source of light so as to be reflected through the tube, none of those optical effects are produced by causing the analyzer to *revolve*, which we have seen occur when the mirrors were at the angles indicated. Another little experiment, and we will dismiss this part of the subject. From observation we find that water reflects polarized light at an angle of 53° instead of 56°. Let us adjust our mirrors as at first. Now cover the mirrors with a film of water, by breathing on them we at once find the light is reflected in a normal condition, and to produce the optical effects referred to we must set the mirrors at the angle indicated for water.

Having thus gained some insight into the nature of the subject, we shall proceed to construct our micro-polariscope.

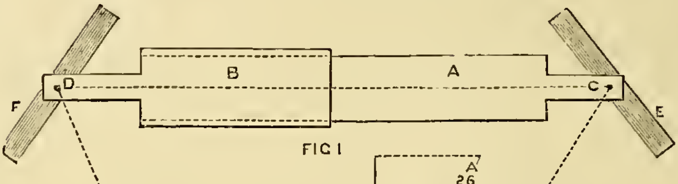
To use reflected polarized light with the microscope is not at all convenient. We must therefore have recourse to another method—and fortunately there is another readily at hand, for when light is transmitted through certain substances under given conditions, the same effects are produced. Indeed, there are various substances that have this property. Iceland spar, as is well known, is a beautiful example of a double refracting media. In all the expensive microscopes this is used.

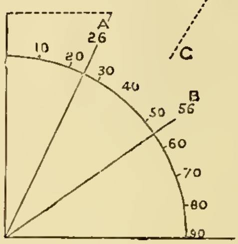
A rhomb of Iceland spar is cut in two—the cut faces polished and cemented together with Canada balsam, one such prism is used for polarizer and another of the same kind for analyzer. An apparatus of this kind is somewhat expensive, costing from 20s. upwards.

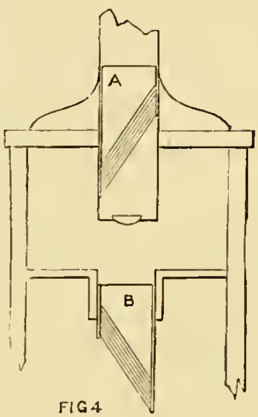
We purpose, therefore, constructing one, though, of course, inferior to one of this kind, yet will form a most interesting and instructive addition to our microscope, and, moreover, will have this advantage to persons of limited means that it will cost (beyond labour) not many more pence than the other does shillings, and can be constructed by any one who has a fair use of his hands.

On the under side of the object stage of the microscope* we placed a short tube which we will call A. We must now make a tube B, Fig. 3, either to fit in it or over it —either way will do, but it must be tight enough to hold in its place, yet loose enough to turn around smoothly when required. Having fixed on the exact size of tube, take a piece of wood (six inches long about), square it accurately of the same size as the diameter of tube B. On a piece of stout cardboard, or, better still, tinplate, draw with a sextant an angle of 26°, Fig. 2, A. For the advantage of those who may not have the necessary instruments I will give a diagram showing the exact angle (Fig. 2). Cut out a *template* at the angle given. Two inches from one end of your wood set a mark, and square around on three sides. On the two opposite sides set the template, and draw a sharp cut showing the angle—be sure that these are exactly square one with the other. Now cut off to the mark and we shall have a chisel-like end at the required angle. Take a piece of sheet copper $2\frac{1}{2}$ inches wide and long enough to go round the core now made. This copper is to make tube B—it can be made in brass, but copper is more easily worked by an amateur. Bend it around smoothly—the edges just meeting.

When on the core, mark with a sharp point on the copper the angle. Now take it off, and with a sharp shears cut off on the mark—put it on core—with a hammer get it perfectly smooth and solder the joint. Finish the angle off with a file.







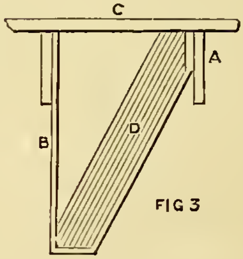


FIG. 1.—THE POLARISCOPE. A, Tube of Polarizer; B, Tube of Analyzer; C, D, Pivots on which Mirrors turn; E, F, Frames of Mirrors; G, Source of Light; H, Eye. FIG. 2.—DIAGRAM OF ANGLES. A, Angle for Glass for Transmitted Light; B, Angle for Glass for Reflected Light as in Fig. 1. FIG. 3.—ATTACHMENT TO MICROSCOPE. A, Tube attached to Stage C; B, Tube of Analyzer; D, Sheet of Thin Glass at Angle of 26°. FIG. 4.—SKETCH OF MICROSCOPE (as in Vol. III., page 157). A, Analyzer in Power Tube; B, Polarizer in Tube of Object Stage.

We now want a shelf all around the edge of the angle on which the sheets of glass are to be laid. Take a piece of stout copper wire, bend it into an oval the exact shape and size of the end of tube, or a thin ring of sheet copper can easily be cut out, this will look much neater.

Now draw the tube over the end of core as far as the wire is thick, place the wire in the tube resting on the core and solder — do it neatly.

We now need several plates of glass of an oval shape, to place in the tube resting on the shelf. When making one some years ago I procured what I wanted of Mr. Lancaster, *Colmore Row, Birmingham.* It is not every optician who is generous enough to assist the amateur in little matters of this kind. I have, however, found him always kindly disposed. You must take a piece of cardboard or tinplate and cut out an oval that will exactly fit into the tube without getting wedged. Send to Mr. L—— or some other obliging optician, and get one dozen cut. Don't get squares, as I did, thinking I could get them cut as I needed by an ordinary glazier. Only a skilled man can do it, and I had to send mine to Birmingham to be cut, and so cost me double. Let each glass be wiped perfectly clean and carefully placed in the tube —from six to nine will be about the number, the others will keep in case of accident. You only want now a tube made of paper, and cut at the same angle to slip into B to keep the glass plates in their place, and the polarizer is complete.

We must now turn to the analyzer. I need not give a detailed account of this, as it is in every essential

* See article on A Cheap and Useful Microscope, Vol. III., page 155.

respect a counterpart of the former. It does not matter whether it is put on the eye-piece end, in the eye-piece, or just over the object glass. Making one for the microscope described, I should advise it to be placed in the body tube over the object glass. We have in the first place to make a tube to fit into the body, cut it at the angle and proceed to construct it as the other. When constructed place it in tube—adjust the polarizer to the under side of stage, and throw up the light by means of reflector. Now slowly turn around the polarizer or body tube, and the phenomena, as in the first instance will be observed, the light diminishing and growing bright every quarter turn of polarizer.

But the amateur scientist will exclaim, is this the only outcome for all our trouble and constructive skill—to such I say, be patient. The chief *scientific* use of the instrument is to reveal the difference there may be in the structure or tissue of a substance, which difference is not discernible by ordinary light.

An illustration will explain this better than a great deal of text. It is a well-known fact that every crystallizable substance crystallizes at a given angle and on a definite plan, and that every different substance has its own particular angle and combination of angles. The only exception, I believe, known to this rule is arsenic, which seems to have no settled habit in this respect, but is a vagabond—sometimes assuming one form and again another.

Let us take a pinch of sugar, dissolve it in a drop of boiling water. Take a clean slide, put a drop or two of the saturated solution on it, let the water slowly evaporate and the crystals will form.

Now place on the stage a piece of selenite, this can be obtained of any optician, costing 2s. 6d., without this many objects will not give colour—place the object to be viewed on this plate, focus your microscope, and turning up the light the crystals will now seem lit up with splendid colours. Supposing the selenite is cut to give blue and yellow light, you will find when the polarizer is in one position the field of vision a rich blue. Now turn around either the polarizer or analyzer, the ground colour will gradually change from blue to yellow—the colour in the crystals changing at the same time, presenting a most fantastic and beautiful object.

The list of objects for the polariscope is a long one indeed. As I purpose writing an article, at some future time, on Preparing and Mounting Objects, I will say but little more, except this, that certain objects, such as fish scales, whalebone, corn-paring from one's feet—when viewed by ordinary light seem to be of similar structure throughout, but when viewed by polarized light show great difference.

The scientific advantage is this, that objects structurally the same will always present the same appearance, and can at once be distinguished from all other substances—though by ordinary light no difference may be distinguishable.

To make this plain scrape a potato in water, and place a particle of the starch on a slide and view it; now take a particle of flour starch, and look at it by ordinary light, they will be indistinguishable except for size. Now view them by polarized light, and the difference in their structure will be at once demonstrated.

I think I have said enough to enable anyone to make what will prove a most interesting addition to the microscope.

I find I have made a slight but important omission in description of polariscope, Fig. 1. When using it with reflected light, as in the figure, the back of each mirror must be faced with black cloth or velvet, when experimenting with transmitted light, of course, remove the velvet.

PHOTOGRAPHIC APPARATUS: ITS PREPARATION AND CONSTRUCTION.

By J. POCOCK.

III.—CAMERA WITH ACCOMMODATION FOR FOCUSSING.

We must in this paper consider the various methods for constructing a camera with accommodation for focussing, so that it can be used with various lenses of different foci.

It will be obvious that the camera-body described in the second paper of the present series, will not answer for an adjustable camera of the kind we are now discussing, because, if used with a short-focus lens, it would be liable to bulge inwards, thus cutting off, perhaps, the corners of the view. The same form of body may, however, be adapted to our present requirement by fastening inside it rings of iron or brass wire, at intervals of about an inch, or the ordinary bellows-body may be used. Several ways of making the latter are given in page 364, Vol. II., of Amateur Work. Of course, it will be easily perceived that in whatever way the body is made, the camera will fold up in quite a different manner to that described in our last paper.

The back of the camera will be made in the manner already suggested for the small quarter-plate camera: the front may be made smaller than the back, but in this case the body must be made in the Kinnear form; an easier plan will be to make the front of camera exactly the same dimensions as the inside of the back (Figs. 8 and 9, page 125), but in either case the top

of the front must be made square, and not rounded. The back may be made rather deeper, so that it will contain the bellows and front when closed; or, again, the front may be made in the same manner and of the same size as the back, so that when the camera is shut, the body is enclosed between the front and back. This form of front is shown in Fig. 26. The base-board also must be differently constructed, and as there are several ways of making this part, I shall proceed to describe two or three of the best, leaving side of which the back can be closed up, and all will be compact.

The hinges may be made as shown in Fig. 24; and if both the bottom and side of front and back are provided respectively with hinges and screw-holes, the camera may be attached to the base-board either horizontally or vertically. These hinges and screws, with small brass nuts for countersinking into the camera, may be obtained from Messrs. Lancaster. The front may be kept up by a small but stout brass button, as

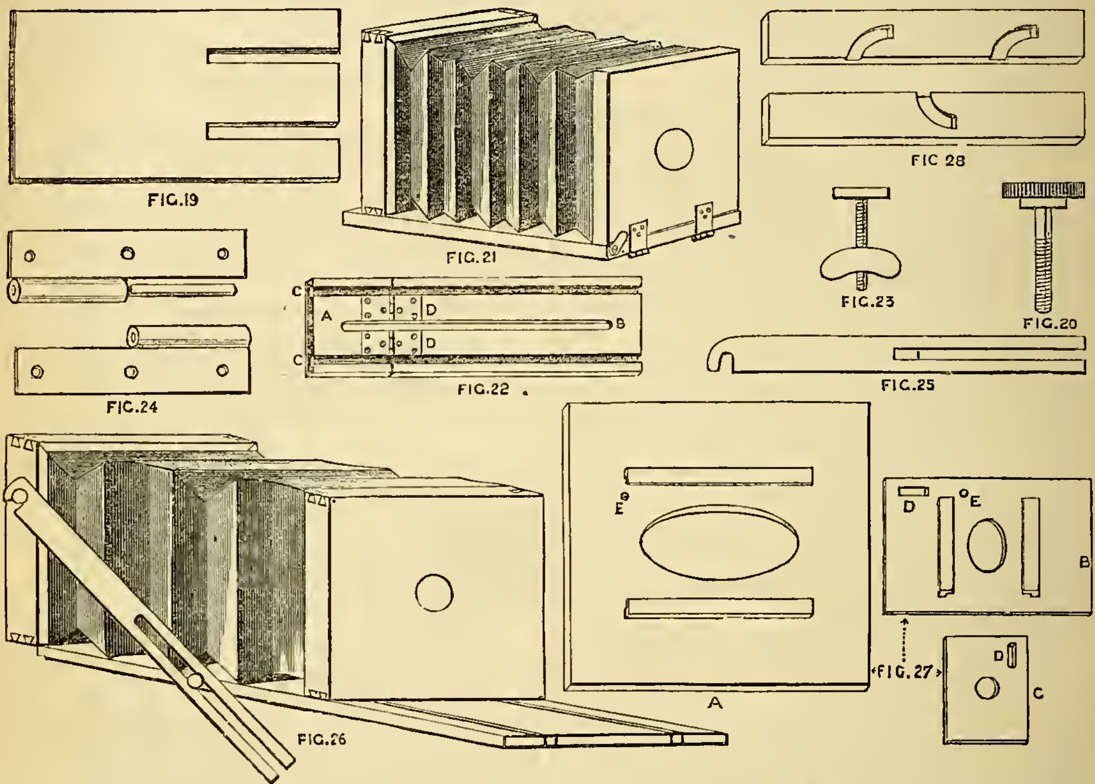


FIG. 19.—BASE BOARD. FIG. 20.—SCREW. FIG. 21.—CAMERA, WITH FRONT KEPT UP BY BUTTON. FIG. 22.—ALTERNATIVE CONSTRUCTION OF BASE. FIG. 23.—SCREW FOR TAIL-PIECE. FIG. 24.—DETACHABLE HINGE. FIG. 25.—STRIP OF BRASS TO KEEP BACK IN POSITION. FIG. 26.—CAMERA KEPT OPEN BY STRIP OF BRASS. FIG. 27.—RISING FRONT. FIG. 28.—SLOTS IN CAMERA FOR DARK SLIDES.

the amateur to select for himself whichever appears to him to be the preferable method.

First.—The base-board may be made in one piece of the same width as the outside measurement of the back of camera, and, for a half-plate camera, about 10 inches in length, Fig. 19. To this base the front may be hinged with hinges similar to those used for the side-pieces of the camera, described in a previous article; and the back may be fastened down with screws of the shape indicated in Fig. 20, through the slots shown in Fig. 19; for folding up, the base-board can then be turned over to face the front, on the other shown in Fig. 21. The back will be kept rigid by the large screws with which it is attached to the base-board through the slots already mentioned.

Second.—Another plan, and one which was successfully adopted by the writer for the first camera which he made, is to make the base of a strip of wood, rather over $\frac{1}{4}$ of an inch thick, and about $2\frac{1}{2}$ inches wide. This is sawn across and hinged (as shown in our illustration) at a distance from the front end corresponding with the whole depth of the camera when closed. Fig. 22 shows a top view of this piece; the front is securely screwed on at A; D, D, are the

hinges ; B is a long slot cut right through the wood to take a screw attached to the back of the camera, which can thus be secured by a thumb-screw in any desired position ; and C, C, are two grooves about $\frac{1}{8}$ of an inch deep, taking two small runners of either wood or brass attached to the under side of the camera back, to keep the back parallel with the front. These last, however, are not absolutely necessary. The tail-piece is kept rigid by the screw, Fig. 23, which secures the camera to the top of the stand. This method of manufacture has the advantage of producing a very light camera.

Third.—Perhaps, however, the best way of all for fixing this class of camera to the base-board, is that adopted by Messrs. Lancaster for their cameras—namely, to hinge the back to the base, and secure the front by means of screws running in slots, just reversing, in fact, the method first described, so far as the front and back of the camera are concerned. The back is kept in position by means of two small clamping screws and a strip of brass of the shape shown in Fig. 25. A camera arranged in this way is shown in Fig. 26, and it has the advantages that by means of the hinged back and slotted piece of brass, all the conveniences of a swing-back are obtained, while it will also be sometimes found useful to be able to set the front at any desired angle, as can be done in this case.

A rising front presents no difficulty. All that is necessary is to cut the hole for the lens rather larger, and screw on two strips of wood in which rebates have been cut, see Fig. 27, thus forming grooves in which slides the piece B ; this piece is similarly treated in order that it may take the piece C which carries the lens. In the pieces B and C small slots D D are cut, and through these screws pass into holes E and E in the pieces beneath, in order to secure the fronts in any desired position.

Before leaving this branch of the subject, I will describe a very simple method of fixing the dark slides into the camera. Fig. 28 shows the bottom and top pieces of the camera back with two slots about $\frac{1}{8}$ of an inch deep in the bottom piece, and one of the same depth in the top piece. In the dark slides, two small round pieces of wood are fitted in the top, and one in the bottom, projecting something less than $\frac{1}{8}$ of an inch, and the frame of the focussing screen is fitted in the same manner. The advantages of this method of fitting lie in the fact that the dark slide is put in much more quickly,—it is, so to speak, jammed close up to the camera back, thus preventing any possibility of the entrance of light ; and if the frame of the focussing glass and that of the dark slide are properly adjusted, the sensitive plate will always come into the same position as that occupied by the ground glass.

For further directions respecting camera making, I may refer my readers to the articles upon the subject which appeared in Vols. I. and II. of AMATEUR WORK.

This brings to an end my remarks upon this branch of the " Construction of Photographic Apparatus ; and in future articles, information will be supplied concerning the making of dark tents, instantaneous shutters, dishes, printing frames, and any other etceteras which may be suggested by any queries which may appear in " Amateurs in Council."

COUCH OF WOOD IN GOTHIC FORM.

WITH ORNAMENTATION IN FRETWORK.

By J. W. GLEESON-WHITE.

AMONG many subjects suggested for treatment in furniture fretwork (see "Alhambra Tea-Table," "Overmantel," etc., in previous parts), I certainly did not include a couch in that material, as at first sight it seemed to be about as unlikely a piece of furniture to make in fretwork, as any in the house ; but the suggestion was made to me by one who knows the possibilities that are within reach, and on thinking out a shape, it seemed readily to adapt itself to this method of decoration, although it is needless to say that the fretwork retires into a proper place (for decorative panels only), and by no means forms the constructive portions of the couch. A fretwork seat does not suggest comfort or warmth, still less strength. Again, the appearance of a fretwork couch, if actually possible to cut, must necessarily resemble a cast-iron garden seat much too nearly to make it a suitable and pleasing object in a drawing-room or parlour.

Two forms of construction were the most likely : the first one was supplied to me, for the decoration to be added, and will appear in this work, by the author of the idea for the couch itself ; while the second is another attempt, using very simple straight line joinery to carry out the idea.

It seemed that a free Gothic form was structurally easy and very strong, while not unpleasant in shape, to those who like the more formal outline of much of the mediæval furniture. It must be understood that it is not intended to be actually Gothic, but in the spirit of the style, and something that if we like we may imagine a Goth (it is always so tempting to suppose the Goths were Gothic) would have planned had that middle-aged genius been asked to contribute prophetically to AMATEUR WORK, though I fancy the true spirit that revelled in the grotesque is dying or dead. With lack of faith in unicorns, griffins (always excepting the ideal

griffin who may be supposed to be the modern golden calf of Mammon we all adore reverentially near Temple Bar), and other fabulous monsters—spite of the octopus and other nineteenth-century animals who have done their level best in looking as grotesque and ugly as they were able—we rather sneer at them, and treat the quaint fancies of the Gothic luxuriance of carved ornament as utterly beyond reproduction now.

This discursive sentence is by way of apology for daring to suppose the real Gothic artist would have accepted such details as those suggested in the sketch; but I think it may be taken as almost certain that a real design, in the highest sense of the word, must not only be worked, but also invented by the same man, who, creator of his own work, and with the spirit of the design thoroughly grasped, is able to modify, he hardly knows why, the details in the actual working-out. So that it seems but little more

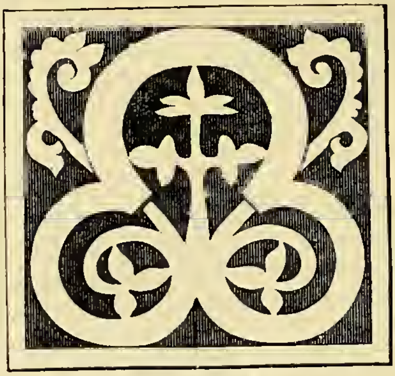
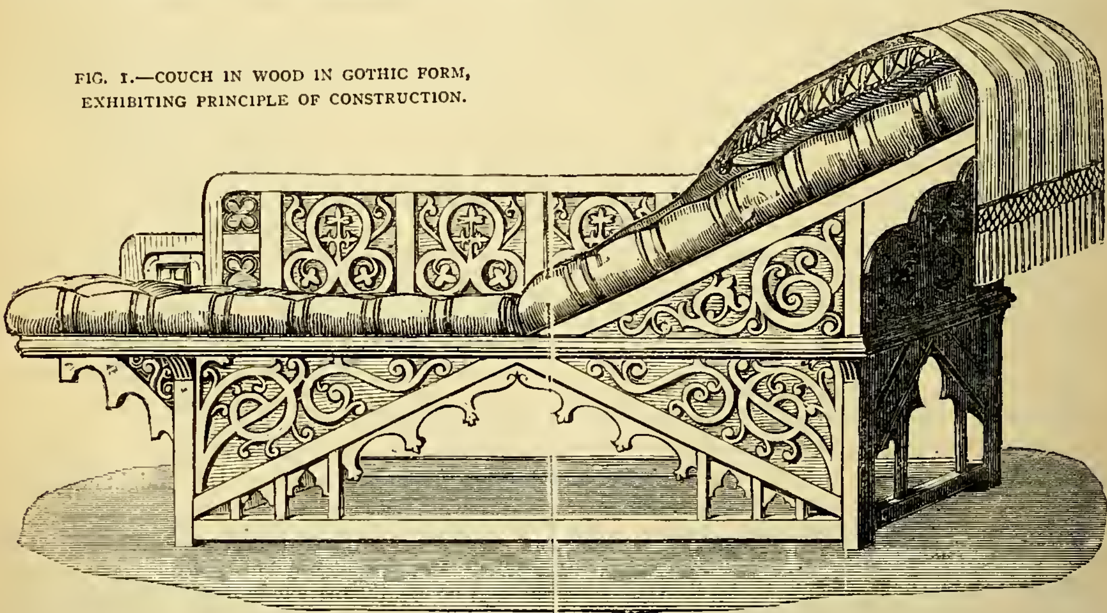


FIG. 2.—MOTIF OF PANELS AT BACK AND SIDE.

to mathematical calculation, so that he can only suggest a harmless compromise, in lieu of the living life-like ornament that grew, as it were, and climbing over the work, lovingly nestling here and there, boldly almost to impudence, accentuating and revelling in some parts, while in others sinking to comparative insignificance, and leaving the simple construction and form the prominent and most definite feature.

It will be seen from the sketch of the couch that the plan consists of an ordinary frame mortised together in the usual way, while struts of wood give firmness to the whole, and one diagonal piece extends from top of back to the lower portions of the legs at the foot of the couch, as shown. Brackets at either end carry the extension of the surface supporting the mattrass cushion, webbing, or thin strips of strong pliant wood, form the top of the seat; while the end, if desired, may hinge, like a box lid, so as (with simple rack adjustment) to be adapted

FIG. I.—COUCH IN WOOD IN GOTHIC FORM, EXHIBITING PRINCIPLE OF CONSTRUCTION.



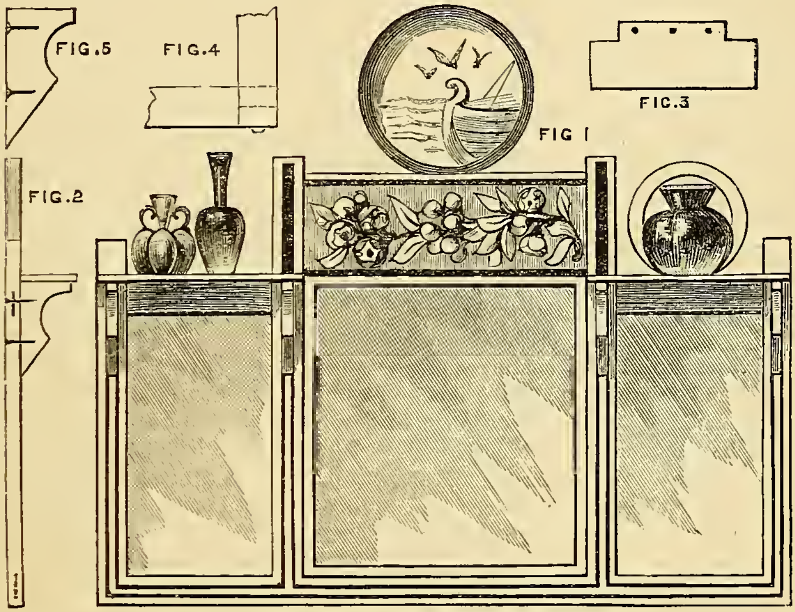
han a decorative pattern is possible when drawings are given for others to work; and if this applies to an ordinary case, where designer and worker are perhaps known to each other, and able to compare notes at any stage of the work, it must be infinitely more so when the designer has to deal with an unknown quantity, plus the humanity fatal to the requisite angle that is desired by any occupant. The back is an additional, but not absolutely necessary, portion; if it be added, the leg at the back of the foot of the couch should be carried high enough to take the top-rail of the back.

The fretwork is shown only by way of suggestion, as the design must be larger in scale than drawn

and when given on a small scale fails somewhat to convey a proper idea of fretwork. The forms given could be easily adapted. For instance, the trefoil with foliage is the motif, so to speak, of the back panels, the leaves conventionalized that fill the space being easily made the right size for the work itself. Under the pointed arch formed by the two struts below the seat, a strip of simple fret-sawn wood is added to break the stiffness of the straight line.

Such a couch would look well in fumigated oak wood; while any artificial staining of the wood makes it more useful to utilise odd pieces of various timber. If the frame were all polished black, and the fretwork in dull black or satinwood, it would probably look well. This fretwork, should not be lined, as it would only assist in harbouring dust and dirt, and make the whole look heavy.

As I have not had time to make one of these, I may have, perchance, overlooked some detail: if so, I shall be glad at any time to give any further information on the subject, and clear up any doubtful part of the design, through "Amateurs in Council."



SIMPLE MIRROR FOR MANTELPIECE OR CABINET.

Fig. 1.—Front Elevation. Fig. 2.—Side Elevation. Fig. 3.—Plan of Shelf on each side. Fig. 4.—Mode of Mortising Bottom Rail and Side. Fig. 5.—Elevation of Bracket.

MIRROR FOR MANTELPIECE OR CABINET.

By W. PRIDAY.

THE mirror which I am about to describe is both simple of construction and looks very artistic when neatly finished: it can easily be made by any amateur who has ordinary skill with his tools, and will form a very nice addition to his room. It may be made for the mantelpiece or fitted to a cabinet, being quite an artistic piece of furniture, especially when arranged with blue china on the shelves. The advantage in making this mirror is that it does not cost much, providing the amateur has all the tools required. The one which I have made is of oak. However, proceeding to work, we shall require foreign or English oak (without knots), this you can buy and cut up yourself, or buy it from a sawmill and get it sawn to the right dimensions for you, which I think will be the cheapest in the end, allowing $\frac{1}{8}$ of an inch for planing. The bottom piece is $3\frac{1}{2}$ feet long, 1 inch thick, 2 inches wide, two uprights in the middle 2 feet 4 inches by 1 inch by $1\frac{3}{4}$ inch; the two side-pieces are $22\frac{1}{2}$ inches long, by $1\frac{1}{2}$ inch wide, 1 inch thick, the pieces under the shelves 1 ft. long, $2\frac{1}{2}$ in. wide, 1 inch thick; the centre-piece, with carving, is 19 inches long, and 5 wide, 1 inch thick; these include tenons in mortise which I have measured.

The first thing to be done by anyone who undertakes to make this mirror is to get the centre-piece carved out; if the amateur cannot carve he must do some fretwork, but as a rule fretwork would be out of keeping with this mirror. If he can neither carve nor fret he must get some little spindles turned in the place of carving. The way in which I carved this centre-piece is as follows: first make a drawing of apple blossom, two flowers and three leaves, and twisted stem or acorns, or anything will do; next get some tracing paper and trace it; when it is traced push the tracing a little higher until it touches the end of the drawing, then trace again, and keep on until you have the wreath as long as you want it on the tracing paper, then paste it on to the wood. Let the drawing be in the middle, so that you can run a bead up the sides, and then begin to carve as soon as

it is dry. I recommend very thin glue water or gum, but disapprove of starch or flour and water, as it leaves your work very dirty. This carving of mine in the centre is the second one I have done, and although not true in some places, yet I have been told is a very good attempt. In carving, when you think it looks as well as you can get it, leave off: do not attempt to finish it off: and keep trying to improve it, and then spoil it after all.

Supposing the carved centre-piece to be finished at last to your entire satisfaction, you must next proceed to plane the wood. You must have two sides true to every piece ; for this you will require trying plane and square. When you have got two sides square and true, mark with black lead pencil to show which are the sides, as everything depends upon having them square for your tenons and mortises. After you have finished planing them all, lay them on the floor, or bench if large enough ; put them in position, the carving $1\frac{1}{2}$ inch from the top of the two middle uprights, the top pieces under the shelves to be 1 inch below the top of the side-pieces under the shelves ; see that all is right, make it square, as any mistakes made now cannot be altered after ; if all is right mark off for tenons and mortises with pencil, and mark so that each number corresponds, and then there will be no bother when fitting them together. Having squared and marked them at the back, you will require a gauge, the tenons and mortises are full $\frac{1}{4}$ inch, the two uprights in the middle pieces go right through the bottom piece, the bottom piece goes through the two side-pieces, as (see Fig. 4) this bottom tenon is very important as it would look very bad if done any other way. If, however, some readers do not quite understand this last piece of information, I shall be glad to answer any questions through the usual medium. The two top pieces under the shelves go right through the side and middle pieces, the carving in the centre goes half way through. If you have got all the tenons and mortises finished, and they are full quarter of an inch thick, they should just fit. Mind you do not split in driving them in ; a little oil rubbed on the tenon assists them very much.

Supposing that you have put the parts together just to see that all is right, mark with pencil where you want your bevel cutting out of the wood, your beading, etc. Now turn to the back and mark out the recess for the glass—$\frac{1}{4}$ inch all round will do for common looking-glass, or $\frac{1}{8}$ of an inch for bevel glass. When you have finished your bevelling, beading, etc., smooth the work with smoothing plane and steel scraper ; having done this, now commence to put the parts together for good with pegs and best Paris glue. You can put oak pegs through the tenons or screws from the back. In gluing you must be pretty sharp, or else when finished you will be able to put a knife between the joints.

Put the work aside for a day or two to allow it to dry ; whilst hardening, you can be cutting out the brackets and shelves—the brackets (see Fig. 5) are 6 inches long and 3 inches wide, and fully $\frac{1}{2}$ an inch thick ; the shelves are (see Fig. 3) to be fitted between the middle uprights and side, and are $\frac{1}{2}$ inch thick, and the front and sides are beaded and rest on the brackets and top piece ; the brackets are fastened by two screws from behind, no screws go from the shelf into the bracket, but simply rest on the bracket ; these screws in the shelf into the top piece to be filled with putty coloured to match the wood. You can leave it as it is or have it French polished. I have brought mine to a tint between old oak and new —a nice light brown that will improve with age— which I did with size and umber. The maker, if he thinks fit, can run a gallery round the shelves with spindles. I have left the four uprights square at the top. I point this out rather than leave it for someone to point it out to me, but in making my mirror I have tried to render it substantial and artistic, and, at the same time, to construct it with as little trouble as possible.

In conclusion, I hope my readers will be able to profit from my article, knowing from experience that it is easily made. There may be others like it, but so far as I know, it is an original, as I have never seen any like it, and is from a design of mine. If fitted to a cabinet it must be fitted as a top is fitted to a side-board ; or if to a mantelpiece, you can get the iron stays to be fitted on to the back from any ironmonger. The amateur has it in his power to enlarge or make the mirror smaller, according to his discretion.

PRACTICAL LESSONS IN WOOD-CARVING.

By E. ARTHUR EDWARDS.

IV.—ENDS FOR BOOK-SLIDE.

HAVING made satisfactory progress with the examples given in the preceding paper, let us now advance to the more congenial study of a design complete in itself. But let it be clearly understood that these patterns are only intended as the occasional lessons upon which the constant practice is to be based, and the carving must on no account be thrown aside until another paper appears, for even supposing no other subject is procurable, such designs as those now given should be done over again in detail —say, two or three leaves at a time—or may even be done several times with what variations one is able to suggest, and considerable improvement should be manifest in each attempt.

The fretsaw must be called into requisition for sawing out the ends, and I presume that all amateur workers are provided with one, as it is indispensable in carving and kindred arts. Be careful that the grain of the wood runs across the pattern, not from top to bottom. In cutting the stalk outline it is not necessary to adhere too strictly to the straight line of our friend, Mr. Euclid—in fact, it is better to impart thereto a wavy natural grace, as it will then more closely resemble the ivy stem it is intended to imitate. Something of a handle will be made by fretting out the space at the top where the bough is bifurcated, and all the remainder must then be treated in low relief. I have purposely chosen the familiar ivy-leaf once more, as it is the easiest for beginners to carve; and I have not yet had my say on its merits as the most appropriate for a probationer to attempt. But for the sake of variety I have given a design for the other end in maple leaves, and those who care to attempt these will not, I think, regret it. Though the ivy leaves are plain and lobate there is a great charm in their very simplicity, and under skilful treatment they can be made most effective. I think it a mistake to treat them too conventionally, and always endeavour to make a freehanded copy of nature in my designs, for I fail to see why her beauties should not be as faithfully re-produced in carving as in the sister arts. To obtain a good notion of the desired effect, the best possible method is to obtain a few leaves somewhat resembling in shape and contour those we are about to imitate, dry them thoroughly, so that they become more or less wrinkled, and then place them in the manner indicated in the drawing.

Having got them into position we will proceed to work. The outline of the pattern should be copied on tracing or other thin paper, and that pasted to the wood and allowed to dry.

After the pattern has been fretted out and the handle made, commence with process No. 1, of "cutting down," as in the first chapter, until a good even depth of $\frac{1}{8}$ inch is obtained. It is better, however, to draw a dotted line (as in Fig. 13) about $\frac{3}{8}$ inch from the rail A B and work from that in the first instance, then when the blocking out is completed this $\frac{3}{8}$ inch should be bevelled off very evenly with 8 or 9 G, so as to make the groundwork descend gradually from the rail to the general depth of $\frac{1}{8}$ inch. The line A B should be run over with a marking gauge, not with a chisel, and it must of course be perfectly straight and parallel with the bottom line.

Where the leaves intersect or overlay one another, the pattern of the upper leaf must still be followed, and all the paper should then peel off, the pattern being indicated by an incised line.

I referred to "undercutting" in a previous lesson, but had not space to dwell upon it. There is hardly anything that puts such an effective finish upon work as this simple easy process, and it should never be omitted. A glance before it is commenced will show how essential it is, as the leaves, of course, appear to be quite $\frac{1}{4}$ inch thick, but by undercutting (the term explains itself) all the superfluous wood is removed, and a remedy for the glaring defect is at once provided.

For undercutting the stalk outlines in Figs. 12 and 13, 2 G will perhaps be the best, as the idea is to give an appearance of bold rotundity to the stalk. There is sure to be a difficulty for some little time in knowing which tool to take in hand as the work progresses, but experience will quickly enable one to decide at a glance. As a general rule, 1, 3, and 4 G will be found most convenient for all purposes; and it is surprising what a number of curves they seem to fit to a nicety. When they have had a good deal of work, and consequently have undergone much sharpening, their points will gradually be rounded off to a great extent, and in that condition they work with much greater ease. It is a well-known fact that all tools work much better when they have seen long service, and this I think is especially the case in carving.

As a rule it is a mistake to use sandpaper, except where a high polish is required, for it fills up the pores of the wood to such an extent that the beauty of the grain is quite lost. If sufficient attention has been paid to sharpening the tools no sandpaper should be necessary, except in one's very earliest efforts. The leaves will no doubt look very rough at first, but practice ought quickly to enable one to tone them down.

Now comes the final touch in the shape of stamping, and it is marvellous what an effect this has where the work has hitherto looked so unfinished and scratchy, for nearly all the inequalities in the groundwork disappear and the carving is thrown up in an unaccountable manner. A very small punch is more generally useful than a large one, such as a star or cross, and a good home-made sort can be manufactured out of a packing needle filed down to the required pattern and fixed in a tool handle, grind it down to the widest part, get a smooth surface, and then file off, so as to leave two or three sharp points close together. If the wood is very hard a mallet may be required, but that involves the risk of splitting the wood, ordinarily it is easy enough to work with the hand. The base should be polished according to the admirable directions given under that head in AMATEUR WORK, and its edges stop-chamfered. Care must be taken to place the ends accurately at right angles to the base, and although they would take a polish nicely, the

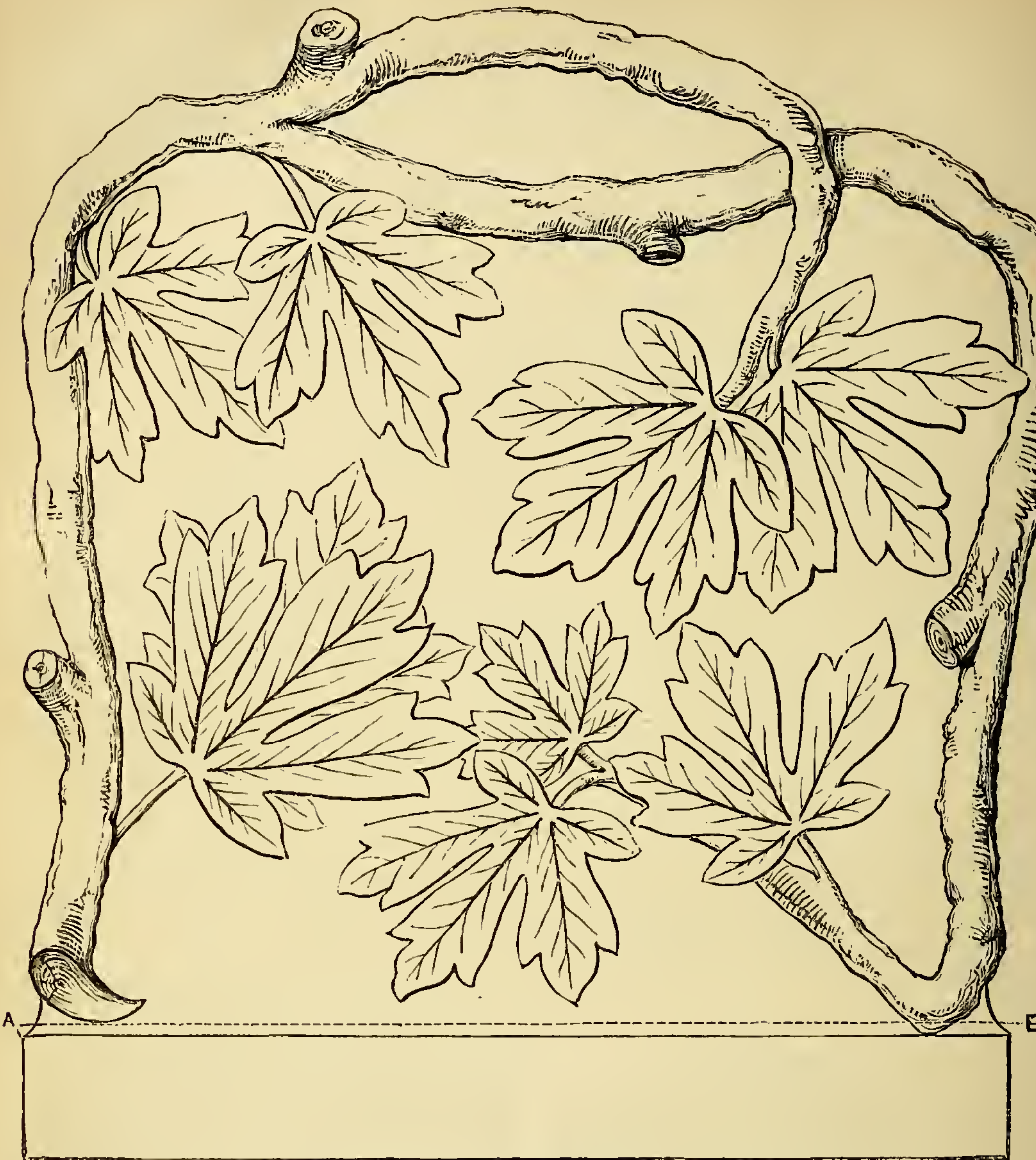


FIG. 13.—ALTERNATIVE DESIGN FOR SIDE OF BOOK SLIDE IN OUTLINE—MAPLE LEAVES.

leaves being broad and smooth, I should be inclined to merely oil and rub them well with a good hard nail-brush ; two or three coats of olive oil should be given and allowed to soak in well for a day or two, then a mere touch of beeswax on the nail-brush, applied with plenty of elbow grease will bring out the carving well. It may get dull after a time, and should in that case be again well rubbed, when it would look as well as ever. Small pieces of baize should be glued under the extending framework to prevent scratches, etc.; and if it is not out of place I must here recommend the fish glue for such purposes—in fact, I find it invaluable in all wood work.

For the alternative pattern of maple leaves, the same processes must be gone through, and the only difference in treatment will be the actual shaping of the leaves. Great care must be taken to clear out the groundwork well between the lobes ; and in order to get it all away at the first attempt, the *cutting down* must be very finely and firmly done.

A wrinkle in carving the leaves is to obtain variety as much as possible in the planes in which the

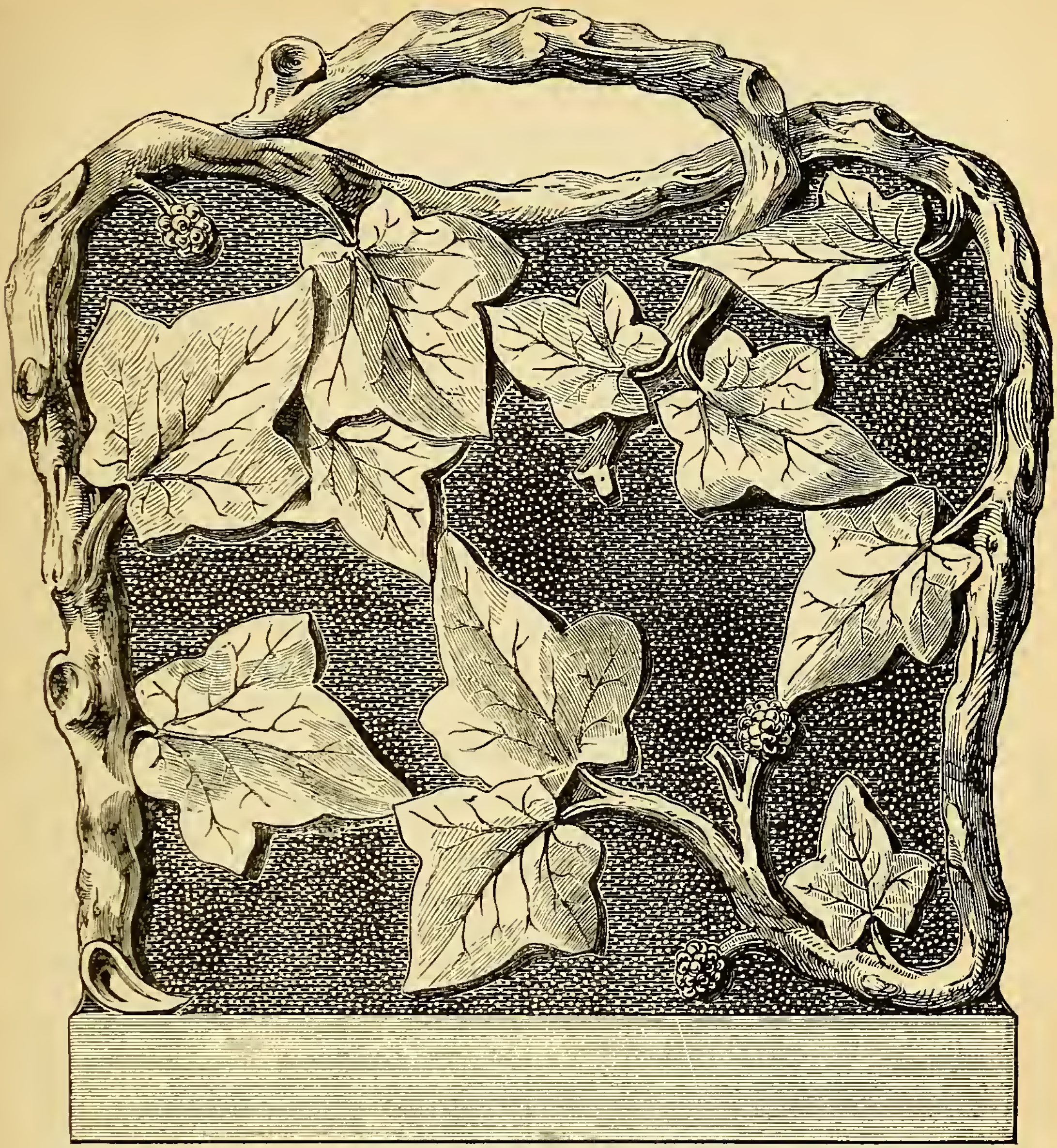


FIG. 12.—DESIGN FOR SIDE OF BOOK SLIDE, SHOWING CARVING COMPLETE—IVY LEAVES AND BERRIES.

lobes lie—*e.g.*, the middle lobe might slant to the left, another to the right, and a third for each half of its length in opposite directions: at the same time there should be slight depressions over the whole surface. The veins should not be quite as numerous as in the ivy leaves.

In Fig. 1 (page 24) the clamp appears to project above the level of the carving-board, thereby hindering the free movement of the wood over its surface. This is an obvious error, and must be remedied by cutting a slot as described in the text, so that the top of the clamp is flush with the upper surface of board. With reference to the size of the two illustrations presented to the reader in Figs. 12 and 13, although they are large enough, as given, for small bookstands, yet it is easy to enlarge them so as to render them suitable for ends of a larger size. For example, on making a tracing of either of these illustrations, and enclosing the design in a rectangle, whose containing lines touch top and bottom and sides at the greatest distance between top and bottom on the one hand, and the sides on the other, it will be found that the con-

taining rectangle is $6\frac{3}{8}$ inches in height, and $5\frac{3}{4}$ inches in width. Divide the base line into eight equal parts, and the top line into as many, and join opposite points by perpendicular lines parallel to the sides of the rectangle. Then, commencing from the base line, set off on the sides as many parts as their length will allow, each part being equal in length to one of the parts into which the base line was originally divided, and again draw straight lines across the design between the opposite points, parallel to the base line, or top line. By this means the rectangle will be divided into a number of squares, except in the topmost row, in which the spaces will not be squares, but rather less. Now, supposing that you wish to make the ends $7\frac{3}{4}$ inches by 7 inches, which dimensions are proportionals to $6\frac{3}{8}$ inches by $5\frac{3}{4}$ inches, and afford a size as large as will be found convenient for any book slide, set out a rectangle measuring $7\frac{3}{4}$ inches in length by 7 inches in width, divide the base line into eight equal parts, set off spaces equal in length to these parts along the sides, and complete the division of the rectangle into squares (as in the design) by drawing the perpendicular and transverse lines over its surface between opposite points. By this means you can produce an exact copy of the design on a larger scale by copying each portion in the smaller squares traced over the design in due proportion in the larger squares of the larger rectangle. The drawing should be executed in firm bold lines on tracing-paper, or any thin tough paper, and transferred to the wood when completed. Thus the size in which the limits of the page have obliged me to place my drawings before the reader will be no bar to the production of them by the amateur wood-carver on a larger scale should he be desirous of doing so.

(*To be continued.*)

NOTES ON NOVELTIES.

By THE EDITOR.

13. Silicine Process of Painting on Glass. 14. New Lantern Microscope. 15. Smith's "Tables, Memoranda and Calculated Results." 16. "The Compendious Calculator." 17. Zilles' New List of Fretwork Designs. 18. Lunt's New Registered Gauges. 19. Smith's "Norfolk" Plane and Melhuish's New Iron Smoothing Plane.

13. SILICINE Process of Painting on Glass.—The special novelty to which I briefly alluded in my last "Notes," is the new process of painting on glass known as the "Silicine Process," and so called because the prepared colours that are used in this kind of painting are mixed with a painting medium to which the name of Silicine has been given by its inventor, Mr. W. E. Jones. A pamphlet descriptive of the system and a specimen of painting executed by the process, have been sent me by Messrs. G. C. Beissbarth and Son, Wholesale Artists' Colourmen and Brush Manufacturers, 39, *Farringdon Road, London, E.C.*; and if I may judge from the latter, I may safely say that all that is said in the former with respect to the brilliancy of the colours employed is in no way exaggerated, for they are very bright and translucent, and possessed of a richness and depth of tint which are rarely, if ever, seen in imitations of painted glass. In saying this, it must not be supposed that I am calling Mr. Jones's new process an *imitation* of stained glass, for it is not so. Silicine work, indeed, is as truly painting on glass as is stained glass; the only point of difference between them being, that the colours used in the former process are not burnt in, while the colours of the latter are rendered permanent by the action of intense heat, and that no leading is required in Silicine work, which is too frequently a disfigurement to genuine stained-glass windows. Of course, the effect produced, as in oil and water-colour painting, will depend much on the skill of the operator, but any one, even without any knowledge of drawing, could, I think, lay on the simple tints without shading, and put in a strongly-marked outline between the colours, and thus produce painting that would be in no way inferior to the specimen before me.

The mode of procedure, as described in the pamphlet, is as follows:—A sheet of glass of the exact size of the window pane to be filled, or the picture to be copied, must first be procured. Having seen that the glass is perfectly clean and free from dust, lay it down on the design, sketch, etc., to be copied, and then with a fine pen, French or lithographic chalk, or brush, trace the outline of the whole subject, or all the lines in it, as a guide to the future work. The tracing is done in ink; if the ink does not flow well use a little ox gall with it. Work in a room as free from dust as possible. When the outline, etc., has been traced allow the ink to dry. If the ink tracing be only required as a guide, turn the glass over and *paint on the reverse side*, and when the picture is sufficiently advanced wash off the ink on the other side so that it may not interfere with the completion of the picture effect. But *paint on the inked side* if the ink markings are required to remain, or if it be sought to imitate the leading seen in stained glass work, in which case the imitation of the lead framing should be marked broadly and painted over with the Silicine paint. When the ink tracings are ready and dry, the glass should be placed on a sloping desk or easel, and a piece of white paper place under it. The tracings can then be seen plainly, and the work also during the process of painting.

The above is sufficient to show the nature of the process, which in itself bears a marked resemblance to the "Vernix Enamel System of Painting on Glass," originated by Mr. W. Sutherland, the Editor of "The Journal of Decorative Art," with this difference, however, that in this system a coating of varnish is laid over the colours after the work of painting is done, but in the Silicine system the colours are mixed with the medium. Other details may be derived from

the pamphlet, entitled "The New Process of Painting on Glass," which will be sent to any applicant by Messrs. G. C. Beissbarth and Son, on receipt of 1s. in stamps. When the work of painting is complete the glass can be fixed in position against the window that it has been cut to fit, by small strips of wood secured by pins. These and all materials necessary for the work are supplied by Messrs. Beissbarth and Son or their agents, who will also send a price list of materials, if desired. Complete boxes of prepared colours containing every requisite are supplied at 15s. each, and the painting medium Silicine separately at 1s. 6d. per bottle, and colours at 6d. per tube, with two exceptions, namely, orange and red, which are 1s. per tube.

14. *New Lantern Microscope.*—At the last meeting of the Royal Microscopical Society a new Lantern Microscope with the oxy-hydrogen light was exhibited, which, according to the opinions expressed by some of the most eminent microscopists of the day, is destined to be of great service to lecturers who require to exhibit microscopic objects to classes or audiences. A number of anatomical and other objects, mounted by Fellows of the Society, were exhibited on a screen fourteen feet square; and Mr. Lewis Wright, the author of "Light," and Messrs. Newton & Co., opticians, etc., of 3, *Fleet Street, Temple Bar, London, E.C.*, the makers of the instrument, received high commendations for the brilliancy and sharpness with which the details of the subjects were shown. The results obtained were, in the opinion of Dr. Dallinger, F.R.S., president of the Society, Mr. Crisp, its honorary Secretary, Dr. Carpenter, Professor Stewart, Mr. Michael, and others, greatly in advance of anything that has been previously obtained, and far exceeding in definition the Giant Electric Microscope exhibited last year. This instrument was also exhibited at the recent meeting of the Quekett Microscopical Society, when the blow-fly's tongue was shown from 6 feet to 14 feet long, and a section of a drone fly's eye was magnified 2500 diameters.

15. *Smith's "Tables, Memoranda and Calculated Results."*—This is a new edition for 1885, of a handy and most useful little book for the waistcoat pocket for mechanics, builders, engineers, architects, surveyors, etc., selected and arranged by Mr. Francis Smith, and published at 1s. 6d. by Messrs. Crosby Lockwood and Co., 7, *Stationers' Hall Court, Ludgate Hill, E.C.* As I have already described the nature and contents of the tiny volume in roan, limp, with gilt edges and rounded corners, in page 523, Vol. I., of this magazine, I need not repeat this information, but refer my readers to the volume and page in question. I am bound, however, to point out that this third and new edition differs from the edition of 1882 in containing 242 pages instead of 226, and that the entire work has been thoroughly revised. The two pages devoted to the Statistics of Agriculture for 1881, have been cancelled, and eighteen pages of new matter added, furnishing "General Rules and Memoranda for Steam Boilers and Steam Engines," and "Useful Suggestions in Cases of Accident or Illness," from the pen of Dr. A. H. Robinson, and originally written by him for the use of the employés of Messrs. Lucas and Aird, Contractors, of Westminster. A neat little almanack for 1885 is pasted within the cover.

16. *The Compendious Calculator.*—Many years ago—I well remember its first appearance, and my wonder at the title under which it was given to the world—this volume was produced under the name of "Intuitive Calculations." It was by no means a happy title as there was nothing whatever, that could be regarded as *intuitive* about the methods of calculations that were advised and suggested in its pages, and I heartily congratulate the present publishers, Messrs. Crosby Lockwood and Co., on the change of front that has been effected in bringing it out under the mere explanatory and appropriate title of "The Compendious Calculator." That it has been found eminently useful is proved by the fact that it has now reached its twenty-sixth edition, of which twenty-five were sent forth under the old and original title. The present edition has been carefully revised by W. C. Norris: the original work was written by Mr. Daniel O'Gorman, and was subsequently corrected and extended by Mr. J. R. Young, formerly Professor of Mathematics at Belfast College. It is therefore "backed," like a bill in the House of Commons, by very good names. It is not a school-book, in the strict sense of the word, but it should be in the possession of every teacher of arithmetic as it affords him the means of showing his pupils how they may frequently shorten and simplify numerical computations by resorting to the expedients set forth in its pages, instead of plodding along by the old and well-worn tracks marked out in the ordinary school text-books. Speaking irreverently, I should be inclined to call it a book of arithmetical short-cuts and dodges, but, perhaps, I had better borrow the present editor's far more dignified description of it, and say that I am alt one with him when he declares it to be "a depository of easy and expeditious methods of calculation for the guidance and use of those whose business occupations require them to be more especially expert in some particular department of the general subject:" it is, in so far as its scope extends, to be regarded as a sort of Arithmetical Dictionary or book of reference for the use of such commercial men, traders, artificers, etc., as may have to do with those arithmetical calculations only which are exclusively connected with their own respective callings. As these callings are special so are the rules.

The book is neatly half-bound in roan and sand-grain cloth, is fcap. 8vo in point of size, and contains 234 pages, including title, preface, etc. Its price is 3s. 6d. There is no trade or vocation to which some portion or other of it does not apply, and it would be difficult to point out any class or description of tradesmen, merchants, and artisans that will fail to find in it numerous short and rapid modes of calculation specially suited to the several and special needs of those to whom it is composed.

17. *Zilles' New List of Fretwork Designs.*—Mr. Henry Zilles, 14, *South Street, Finsbury, E.C.*, wishes me to say that his New List of Fretwork Designs is now ready, and will be sent to any address on receipt of 4d. in stamps. I have already expressed a favourable opinion of the designs produced by Mr. Zilles for Fretwork, Carving, Inlaying, and Wood-painting, and can say that his new patterns are in every way equal to those that he formerly had in stock. Among them are some excellent cases for clocks, which

appear to me to be well worthy the attention of fret-sawyers.

18. *Lunt's New Registered Gauges.*—By the courtesy of Mr. A. S. Lunt, Mechanical Tool Manufacturer, 297, *Hackney Road, E.*, I am enabled to put before my readers an illustration of the New Registered Gauges, to which I referred in page 41 of this Volume; and—having had an opportunity of handling and testing both the marking gauge and the cutting gauge—to add my testimony to their efficiency as tools of this class, and to the ease and rapidity with which the head of the gauge can be tightened or loosened as may be required, and shifted to any desired distance from the marker in one case, and the cutter in the other. In Fig. 1 the cutting gauge is shown complete; in Fig. 2 a section of the stem, A, and head, B, is exhibited; and in Fig. 3 a section of the stem, A, apart from the head. An inspection of the stem will show that it is made slightly oval on one side, as shown in Fig. 3, and that a projecting ridge about $\frac{1}{16}$ inch, or a little more, is caused by this formation from end to end of the upper side of the stem, as clearly shown in Fig. 1. A hole similarly made is pierced through the head, as shown in Fig. 2. Now, if the projecting rib of the stem be turned so as to fit into the corresponding hollow in the hole made in the head, the head is loosened, and may be moved at pleasure up and down the stem, "not too easily, but easily enough," with due apologies to Mr. Toole. When it is desired to tighten head, the em is turned so as to bring the ridge away from the corresponding indentation in the former, and it will remain immovable until the stem is turned in the contrary direction. Time is saved by dispensing with the thumbscrew used to tighten the head of the ordinary gauge, but the new registered gauges are as cheap as those in the old form, the marking gauge being sold at 7d., and the cutting gauge at 9d. The stem of these gauges is $9\frac{1}{4}$ inches long, and about $\frac{11}{16}$ inch in diameter. The head is octagonal, $1\frac{1}{8}$ inch thick, and $2\frac{5}{8}$ inches square, the corners being removed to produce an octagonal form, which is more convenient to handle. They are made of beech, and the sides of the head are nicely varnished. In the cutting gauge a strong stiff knife-like blade is inserted, and held in place at any desired depth by a brass wedge, as shown in Fig. 1. This blade is strong enough to rip down thin wood, as, for example, lathing for trellis work, which may thus be gauged and cut with comparatively little trouble.

FIG 3

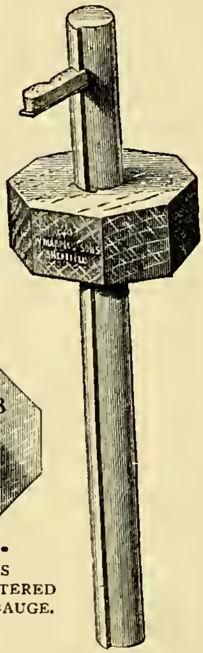


FIG. 1

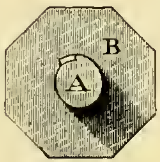


FIG. 2.
LUNT'S
NEW REGISTERED
CUTTING GAUGE.

19. *Smith's Norfolk Plane and Melhuish's New Iron Smoothing Plane.*—These two planes were sent to me on the same day, one by Messrs. A. Smith and Co., 20, *Kearsley Road, Highfield, Sheffield*, and the other by Messrs. R. Melhuish and Son, 85 and 87, *Fetter Lane, London, E.C.* I am constrained to notice these planes together, on account of the great similarity of appearance that exists between them at first sight: indeed, so closely do they resemble one another, that I was at once put in mind of the "Comedy of Errors," and was inclined to think that a couple of Dromios or twin Antipholi had turned up to puzzle me in the shape of a pair of planes. I believe it is usual for persons who are blessed with twin sons or twin daughters to examine them with the closest scrutiny in order to detect marks of dissimilarity, by which the separate identity of each may be clearly established. So, in accordance with this necessary and most desirable custom, I placed the planes side by side and had a good look at them. That they are undoubtedly very much alike in general appearance—almost identical in fact, as I thought when I first saw them together—the reader will allow, I think, on comparing the illustrations that are given of the Norfolk Plane in Fig. 4, and of the New Iron Smoothing Plane in Fig. 5; but on close inspection I found that there were many points in which there was a difference, and these I will endeavour to point out to the best of my power. In the first place the wedge of one plane bears the legend "The Norfolk," and that of the other, "Patent No. 7855," a distinction sufficient for all practical purposes. The following table will show the sizes of these planes, and exhibit the points in which they agree and differ, as far as weight and measurement are concerned:—

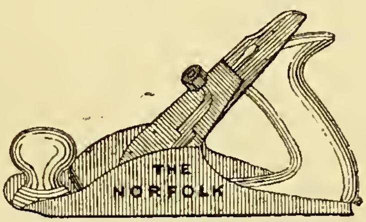


FIG. 4.—THE "NORFOLK" PLANE.

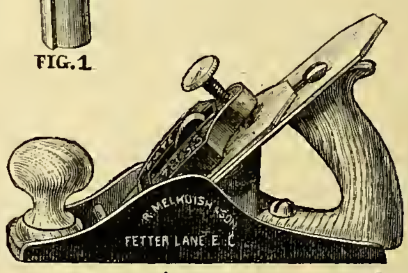


FIG. 5.—MELHUISH'S PLANE, PATENT NO. 7855.

	WEIGHT.		SOLE.		CUTTER.		KNOB.		WEDGE.	
			Length	Brdth	Length	Brdth	Heighth	Dia.	Length	Brdth
	lbs.	oz.	in.	in.	in.	in.	in.	in.	in.	in.
The Norfolk,	2	$10\frac{1}{4}$	$8\frac{3}{4}$	$2\frac{1}{4}$	$7\frac{1}{4}$	2	2	$1\frac{7}{8}$	$3\frac{1}{8}$	2
Patent No. 7855,	3	1	$8\frac{3}{4}$	$2\frac{1}{4}$	$7\frac{1}{2}$	2	$1\frac{7}{8}$	$1\frac{5}{8}$	$3\frac{1}{8}$	2

From the above data it will be gathered how much alike these planes are in point of dimensions. In weight No. 2 has the advantage of No. 1, and from this it may be inferred that it is the more stoutly built plane of the two. For the sake of brevity I shall continue to style these planes No. 1

and No. 2, No. 1 representing the Norfolk Plane, and No. 2 Melhuish's Plane, or Plane, Patent No. 7855.

Let us now look at the construction of each, taking in order the three parts into which each plane resolves itself—namely, 1, The Body; 2, The Plane Iron; and 3, The Wedge. In No. 1, within the two sides that rise from the sole, are rests to receive and sustain the plane iron—namely, two triangular projections from the sides, close to and behind the slot, and a transverse piece further back between the sides at their highest point. Testing the sole, I find it to be fairly true, but the slot is not cut as truly square as it ought to be. The knob, which forms a rest for the hand in front of the plane, is secured by a brass-headed screw entering a projection from the sole, which is covered and concealed by the shank of the knob. The brass head of the screw before me projects slightly above the surface of the wood, and would prove detrimental to the hand of the operator. The tool is secured to the sole in a similar way by two screws, which pass through it—one behind the transverse mid rib, that helps to support the plane iron, and the other throughout the length of the part of the toat, which is grasped by the hand. Thus far for the body of No. 1. In the body of No. 2, I will begin with the sole, and say that I find this accurately level when tested by application of the square, and the slot truly cut. The casting that forms the body is the same in form as that of the body of No. 1, with this important difference, that across the transverse mid rib, from the centre of the sole, rises a piece of iron $2\frac{5}{8}$ inches high and $\frac{3}{8}$ inch thick, terminating above in two horns, so to speak. The plane iron, when put in its place, is dropped over the foremost of the horns, a slot being cut through both parts of the plane iron for its reception, the screw which holds the two parts of the plane iron together drops into the depression between the horns, and the upper of the two parts rests on the hindermost horn. Thus, instead of resting on four points, as in No. 1, the iron in No. 2 is sustained in six places by projections rising from the sole, and thus gains considerably in stability. The top of the knob is perfectly smooth, no screw by which it is attached to the sole being apparent, and the toat is secured by two screws—one, a mushroom-headed screw, that enters it near the projection parallel to the sides, that is notched into the handle, and another that enters it from the end of the sole, the end being recessed so that the head of the screw may be well above the surface of the wood that is being planed.

Next, comparing the plane irons, I find that the iron of No. 1 is not so substantial as that of No. 2, but very much lighter in make, and the sides of the two parts of the plane iron are not coincident throughout, but that the upper iron overlaps the cutting iron on one side but falls short of it on the other. The edge of the cutting iron, however, is square with its sides. The defect I have pointed out can be remedied by grinding down. Messrs. Smith and Co. claim for the irons of their planes that they are warranted, and "will wet up on the oilstone without ever requiring grinding." In the plane iron of No. 2. the sides of the double irons are true, but the edge of the cutting iron of the plane sent to me is not ground square, a shortcoming which also has an easy remedy. Of course the cutting iron in No. 2 will require renewal before that of No. 1, on account of the great length of the slot that is rendered necessary for the admission of the projection I have spoken of. The length of cutting iron from slot to edge in No. 2 is $1\frac{1}{4}$ inch, and in No. 1, $2\frac{1}{2}$ inches. The cutting irons in both planes appear to be of good quality.

Lastly, as regards the wedges, I find that in the wedge of No. 1 there is in each side of it a groove, which, when the wedge is put in its place, is entered by a short stud riveted into the side of the body. The brass screw with the milled head, that passes through the top of the wedge is then brought to bear on the plane iron until it is sufficiently tightened to hold the iron in its place. The action of the screw should bring the lower edge of the wedge in contact with the iron throughout its breadth, but it fails to do so in this case as it bears more on one side than on the other. The milled screw is very rough and destitute of finish. In No. 2, the wedge when put in place is slipped over and sustained by the foremost of the horns that I have already spoken of, a slot being cut in the wedge for this purpose. The upper part of the wedge passes under and is caught by a projection at the top of the horn, and when the milled screw in the top of the wedge—which screw, by the way, is of far better workmanship than that in No. 1—is brought to hear on the plane iron, the upper part of the wedge is gripped by the notch in the rear of the foremost projection, and the lower edge is depressed on the iron imparting a firmness and rigidity to the whole which it is not possible to disturb until the pressure of the screw is relaxed.

The price of each plane is 5s., and Messrs. Smith and Co. say they will be happy to forward their plane to any amateur who may find any difficulty in obtaining it, for 5s. 9d., carriage free. No. 2 can also be sent per parcel post for 9d. To sum up, both planes are cheap iron planes, but No. 2 is decidedly the cheaper plane of the two because its principle of construction is better, as I have shown, and its finish is better. The only fault that I have been able to detect in it is the want of truth in the edge of the cutting iron, and Messrs. Melhuish and Sons will do well to test every plane in this particular, and see that there is nothing to be complained of in any point before sending them out to customers. Messrs. Smith and Co. must also see to correctness of detail and finish in their planes, otherwise amateurs who purchase them will be apt to find fault with them when they have got them. Of course, in the production of cheap iron planes that will pay for making, there is, and must be, a tendency to abridge the labour that is necessary to turn out a good tool, and to ensure accuracy of fitting, and absolute truth in every detail; but it must be remembered that an inferior tool can never be a cheap tool, though it by no means follows that cheap tools must, of necessity, be bad. For my part, I do not share in the general desire that seems to have cropped up for metal planes. For my own use I prefer the old-fashioned wooden plane with an iron sole to it, which certainly forms a happy medium between wood on one side and iron on the other; and I do not think I am far wrong when I say that I think it is likely that the time is coming quickly, if it be not absolutely at hand, when a reaction will set in in favour of the wooden planes which have been for some time much below par in public estimation.

AMATEURS IN COUNCIL.

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine, the information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

Rendle's Electric Paint Remover.

NOVUM SARUM, after taking me to task for the offences that I commit against the readers of AMATEUR WORK in recommending "untried novelties" (a crime of which I have never been guilty—ED.), and recommending me a little more caution in this respect, in order to save myself "Some dozens of indignant letters from persons who have tried and condemned them" (which indignant letters, somehow or other, I very seldom get, as witness "Amateurs in Council"—ED.), then proceeds to relate his experiences with regard to Rendle's "Electric Paint Remover."

Says NOVUM SARUM:—"Having to strip off a very tough satin wall paper, and seeing in your monthly that amongst some dozen other wonderful powers, 'Rendall's (*sic*) Paint Remover' was stated to be equally useful for paper as for paint, I invested, not in a half-crown or five-shilling tin, but (more cautious) in a sixpenny size, which I got at the maker's in Victoria Street. This I applied, with scrupulous attention to the printed directions, with what result? Failure! It made the paper harder than ever. A suggestion from a young fellow who was helping—several kettles of quite boiling water—overcame the difficulty like magic. Even 'Rendall's Paint (and paper) Remover' yielded to this drastic remedy."

My chief consolation and comfort under all this is, firstly, that Rendle's Electric Paint Remover has been commended for the purposes for which it is manufactured and sold in trade organs edited by men who know far better about its value than I do, so that I sin in good company; and, secondly, that, after all, our friend, thanks to his caution, did not lose more than sixpence by my alleged recommendation of an untried novelty. The Paint Remover requires time to act, even upon very tough satin wall paper. Possibly NOVUM SARUM expected the paper to shrivel up and drop from the walls as soon as the brush passed over it, but if he looked for this he expected a little too much, as people very often do when trying experiments; and I think he went a step or two farther in this direction than he ought if he thought that a sixpenny tin of the Paint Remover would be sufficient for a piece of work that "several kettles of quite boiling water" were required to effect. I trust that others who have made trial of this preparation will send me their experiences.

Sign Writing, etc.

A. B. C.—A contributor to AMATEUR WORK, who is now engaged on a series of papers, will take up this subject as soon as the work that he now has in hand is completed. There is a book on the subject entitled "A Practical Manual of House Painting, Graining, Marbling, and Sign Writing," by the late Mr. Ellis A. Davidson, published at 6s., by Crosby Lockwood and Co., *Stationers' Hall Court, London, E.C.*, which will, I think, give you such information as you may require. With regard to writing names and addresses on carts, waggons, etc., if you merely desire to meet the requirements of the Act of Parliament, the letters must be one inch in height. There is no further specification respecting size, and they may be as narrow or as wide as space may require. Of course, this is only in reference to painting name and address on market-carts, etc. All you require is a tube of oil colour, white or black, according to the colour of the ground, a camel-hair pencil having hair of some length, and a stick on which to steady the hand when writing.

How to Address the Editor.

A SUBSCRIBER FROM THE FIRST writes:—"In addressing the enclosed [a reply to an advertiser in Sale and Exchange Department.—ED.], I looked for *an address of the Editor*, but can only find that in the front page where the Publisher's name is. Will you kindly put the address you wish at the head of the Correspondence or Sale Column, or some other convenient place for your correspondents to find?"

Please to turn to pages 42 and 46 of this Volume. I thought I had smoothed over this difficulty at once and for ever by what I have said there. Any thing, whether parcel or letter, addressed "*The Editor*, AMATEUR WORK, *Warwick House, Salisbury Square, London, E.C*," will reach me. And correspondents will greatly oblige by taking a *short* nom-de-plume. That which you have adopted is one which is frequently taken, and, therefore, likely to lead to some little confusion in replies.

Second-Hand Tools for Novices.

E. W. H. writes:—"May I suggest that the buying of second-hand tools by a novice is fraught with much danger, and possibly may be no saving to the purse. A second-hand plane, for instance, is very liable to be out of truth, and to have a mouth into which the end of a foot-rule might be inserted; and, again, a square is very liable to be anything but square. I fancy nothing is more liable to injury, if, for instance, dropped, or jammed by heavy work against the wall, if there is one at back of bench. Amateurs do not always clear their bench, or, indeed, professionals either. I would strongly recommend a celerité hand-saw, as, owing to its easy working, there is not so much tendency to force it in the wood—which is the custom of beginners—and the price is not great. There are few beginners who do not know of an obliging professional who would gladly purchase for them good second-hand tools. I may add, I have by me a few tools which I thought a bargain, but which were not really so, beyond teaching me some of the bad points; but then I don't think the information was cheap. I am glad to see almost every article is more precise in details as the Magazine goes on, though some still give professional terms unexplained, or talk about 'a solution' of so and so without telling the proportions." [Pains are taken to make the information given in the Magazine as clear and precise in detail as possible, but it is difficult for some writers to realise that those for whom they write require to be told things that a man who knows his subject himself is prone to think that everyone else knows. Of course, novices must buy second-hand tools, *cum grano*, as it were. A square is a tool that is easily tested, by applying it, first, to one side and then to another side of a piece of wood, whose edges are truly parallel, and seeing if the edge, when the square is applied to the second side, coincides with the pencil line that has been drawn on its application to the first side. The square that I constantly use was bought second-hand years ago, and is as true, and therefore as useful, as ever it was. Second-hand tools require putting to rights, but I have always found carpenters ready and willing to execute what I could not do myself in the way of needful repairs for a trifling sum. New tools are not always better than old ones, I have found, unless they are by good makers, and therefore to be depended on.—ED.]

IOTA writes:—"In the article entitled 'Help for Struggling Amateurs,' published in Part 36 of AMATEUR WORK, the writer advises the purchaser of second-hand tools. I fully reiterate his advice, but would extend it to all amateurs, whether struggling or not. Many of your readers, like myself, may not be near these 'marine stores,' 'pawn-shops,' or 'happy hunting grounds,' where their longing eyes may light upon 'just the tool they are seeking,' and should their means be limited, and thus unable to run to the nearest 'tool shop' and buy it new, and they are oftentimes doomed to wait an indefinite period, which sometimes means the job is thrown aside unfinished. Lately I went on a 'voyage of discovery' (not to visit the moon) but for tools. I made a journey to town, and in the neighbourhood of Tottenham Court Road, I lighted on a shop in a very secluded corner, where, arrayed in 'coats of shining brown,' I saw second-hand planes in rich profusion—planes of every size and shape, for rough and fine work, were there. You may guess my delight. I got just exactly what I wanted at about half the price of new, with the additional cheering words, 'If I haven't got what you want in stock, I'll make it for you,' which means 'I will alter a plane to suit you.' Should any of your 'struggling or other amateurs' need second-hand planes, trying, jack, smoothing, moulding, reed, sash, yea, any kind of plane, let them call on T. Deeley, 12, *Mortimer Market, Tottenham Court Road, London, W.C.*, and I know they will be provided with what they want, or, if living in the country, they will write to him, telling him what they need—if anything special send a drawing—he will let them know its cost, and will send it on receipt of cash. If they have old planes they need repaired or altered, I was told by an authority, 'No man in London or country can do them better.' This I have in some measure proved; he has repaired some for me, and they work splendidly. Perhaps some of 'our amateurs' have had the joy of finding similar shops for other tools. It would be a boon to all your readers, if they will kindly let us know where they are. I ought also to say, in this shop there are

other tools to be had, such as second-hand saws, edge tools, squares, etc." [We are all indebted to you for making us acquainted with Mr. T. Deeley.]

Travelling per Kite.

GETTING GREY ON THE TOP writes:—"I notice that in a recent Part of AMATEUR WORK ONE OF THE RISING GENERATION asks: 'Can you tell me how travelling by kites is done?' I remember when at school in a town on the old coach road from Bristol to London, to have seen a carriage drawn by a pair of kites pass through the town on its way to London. It accomplished the journey from Bristo to London in the day. The carriage was a kind of bath-chair on two wheels, with a third guiding-wheel in front; it carried two gentlemen. The kites were said to be made of silk, with very long silk cords to restrain their steady course far above the town. The kites were visible long before the carriage came in view, and after it had passed out of sight. I do not remember if they had any other check to their journey but the 'Old Bear' on his support, which crossed Hungerford Street, compelled them to stay and pass the lines over this barrier. As it is now nearly fifty years ago my memory does not enable me to furnish exact particulars, but I send these in case they may be of interest to your correspondent. Other ideas crop up connected with about the same time; more than thirty coaches passed along that road, the coaching interest opposed the Great Western Railway, and turned it a more northerly course; but two steam-carriages had travelled from London—one a compact coach and engine combined, the other an engine and carriage to follow, a more cumbersome affair. If asked at that time which conveyance would be preferable in time to come, it would have been very difficult to predict the present general use of steam. No coach now runs, but two railways serve a much larger traffic; the old road waggons with 9-inch tires and six or eight horses have also disappeared. Who can say what the future may have in store for juvenile inventors?" [I do not claim to take rank among the prophets, but I think I may safely declare that the future has nothing in store for juvenile inventors, or inventors of riper years, in the way of travelling per kite. The accomplishment of the journey from Bristol to London was a fortunate accident, due to the complaisance of wind and weather, and the restricted amount of traffic fifty years ago, which offered comparatively little hindrance to the enterprising travellers. Had this mode of travelling been in any way feasible, it would have been perfected long ago. As I have already said, AMATEUR WORK is devoted entirely to matters which are practical and capable of realisation, not to the building of *chateux d'Espagne*, and the ventilation and discussion of visionary and impracticable projects. Remember Icarus and the fate which overtook him when he was travelling in mid-air.—ED.]

A. L. writes:—"Your somewhat severe reprimand to ONE OF THE RISING GENERATION induces me to submit to your notice a few remarks on kite carriages, as made and run by Mr. Pocock, of *Bristol*, about the beginning of the present century. I will take up as little of your valuable space as possible. The kites were usually arranged in tiers of two or more, the first was called the pilot, and its duty was to keep the others elevated; it differed in no respect from the ordinary kind, but its string was attached to the back of the main kite. In the latter we find a novel feature, the string consisted of four distinct lines enclosed in a cotton case, open at intervals to permit the lines to be manipulated. One line was attached to the backbone near the middle, another near the tail, and the others, one at each shoulder. When the kites were elevated, and all ready for starting, the tail line of the main kite was drawn in, and thus the wind brought to bear on its surface. This exercised a drawing force proportional to the area of the surface and the force of the wind. In an ordinary brisk breeze, and with a superficial area of one hundred square feet, four or five hundredweight was easily drawn along. The direction of the wind made little difference since it is possible to sail as close to it as in a fore and aft vessel. Any light carriage would do for the vehicle, but Mr. Pocock made some which were specially adapted to the purpose. I will only add that on several occasions they ran twenty-five miles in an hour, beating stage-coaches easily." [I am obliged to you for the above, but my opinion as to the utility of the kites remains unaltered.—ED.]

THE AUTHOR OF THE ARTICLES writes:—"Briefly, the statements in 'The Boy's Own Paper,' in the third and sixth volumes, on the subject of Kites, Kite Carriages, and Kite Boats, are facts. Further information will be found in the correspondence of the other volumes all duly indexed. Mr. Alfred Pocock, of *Kingswood Hill, Bristol*, one of the old kite travellers, will, I know, be glad to supply the kites to order on reasonable terms, and give particulars as to their management."

Clock Making.

ANTON writes:—"Now that we have castings and parts, finished and unfinished, of lathes, steam engines, etc., for the benefit alike of amateur and engineer, might I suggest that some *good* firm of clockmakers should supply the parts of a clock in the same manner—one that is something more than a bit of sheet brass and a few bent wires. I would suggest one after the style of the astronomical regulator, but with plain dial, with either dead-beat or gravity escapement (preferably, I think, the latter), and with a zinc and steel compensated pendulum. The case might be left to the taste of the maker, though on account of the weight of the pendulum it would be best stood on the floor. I am sure that if some maker would supply every part, either finished or in the rough, and contribute an article on putting together, he would earn our gratitude, and sustain no loss to his pocket, to say nothing of placing a good English clock in the market, and that at a moderate price, if to a great extent made on the interchangeable system."

Pyrotechny.

T. G. C. (*Aldershot*).—You will find instructions for the proper mode of filling-in the head of a rocket with stars and brilliant lights, and for making tourbillions in any elementary work on Pyrotechny; as, for example, those which are published at the Bazaar Office, 170, *Strand, W.C.*, by Kentish's book on this subject, published by Messrs. Chatto and Windus. Your letter involves not so much a question of setting you right on any point that you do not understand rightly, but rather shows you to be seeking elementary instruction in the art of making fireworks. To answer both your queries at length would really be to teach you the rudiments of Pyrotechny, and would occupy about half the number of pages given in a part of this Magazine. If, after following the instructions given, you want further advice, I shall be pleased to help you. I may add that the works on this subject, published at the Bazaar Office, are by W.H. Brown, Ph.D., M.A., L.R.C.P., etc., a most reliable authority, and comprise, "The Art of Pyrotechny," 2s. 6d.; "Minor Fireworks," 1s.; and "Practical Firework Making for Amateurs," 3s. 6d.—SCRUTATOR.

Octave Coupler to Harmonium.

ANTON writes:—"In page 494 of Vol. III., LINDUM, in reply to HARMONY, stated how he had improved his harmonium by a combined swell-box and octave coupler, and stated that it was the only harmonium he had seen thus constructed. Though there is nothing new in this arrangement, I have been patiently waiting for a full description with sketch, as requested by the editor. If it is so easily applied, as LINDUM says—only taking a night or two to make—I think it would not take long to describe. May I ask LINDUM to accept the editor's invitation?"

Reed Voicing.

OPHICLEIDE.—I am not a reed voicer; that is a special branch of the trade, and known but to a few. I am, therefore, in a position similar to that in which you find yourself; and anyone who could and would give you the information you seek, would benefit me also. I am afraid the method of reed voicing is not to be learned from books or from printed or written instructions. I should be very glad to find it could be.—A. J. (*Clapham*).

Blue Printing Process.

H. S.—You ask, "In the Blue Printing Process, can the paper be excited first with the citrate of iron and ammonia, and sensitised afterwards with the prussiate of potash, if wished?" To this I can only reply that I have not tried the experiment, and cannot spare time to do so, as I am exceedingly busy. I see no reason, however, why it should not answer, as the solutions are only sensitive to light when mixed, but of course it means double work, so I fail to see any advantage in it. If you had read the communication from P. B. (*Cork*), in page 44 of the current volume, you would have seen that he forestalls your question, and thus renders it unnecessary."—G. D. C.

Plaster Models for Electrotyping.

BURCOMBE.—These may be bought of Mr. J. W. King, 15, *St. John's Square, Clerkenwell*, who will advise you on everything in connection with this pursuit on which you may require aid or instruction.

Making Telephone Magnets.

MAGNET.—Bars of best tool steel required length and size. Anneal by heating to red heat, and cool slowly in hot ashes. Turn off outside skin in lathe, and make quite smooth. Heat again to bright red, plunge in cold water, and thus harden the steel. Procure a hollow coil of three layers No. 20 cotton-covered wire. Place this in a circuit with a "make-and-break-circuit" contrivance attached to three Bunsen cells in series. Pass the steel bars through the hollow coils several times in one direction whilst current is passing through the coil, and until the bars are magnetised enough to hold each other up. The United Telephone Company can, if it chooses, proceed against any maker or user of telephones of the Bell or Edison pattern not supplied by the Company, or rented from it, to obtain an injunction. Its action against amateurs, however, would be an exhibition of mean and petty jealousy.—G. E.

Hydraulic Motor.

SAVOIR FAIRE.—You *can* make the wheel as you propose, and it will be strong enough, but you will have to be very exact in cutting out the wheel, to cut each of the three pieces true, and if you fail to do so, you will have no end of trouble. Again, if you use three pieces of ¾ inch matchboarding, the wheel will be barely 2½ inches in thickness when planed; this will not matter much if you do not require very great power, but in order to cut it out with your fret machine (2 feet clearance) you must either reduce it in size, and, of course, its power also, or else if you make it the size of drawings, cut the wheel and rim of case separately, which you will find adds considerably to the work of making this motor. Cutting the wheel and rim of case out of one piece of wood simplifies the construction immensely, as you will find if you try it. If you must use matchboards, don't depend entirely upon glue in joining them together, but use some screws well countersunk as well.—CATO.

Carbon Papers.

SAVOIR FAIRE sends the following recipe —Lard, 5 ozs.; beeswax, 1 oz.; Canada balsam, $\frac{1}{16}$ oz.; lampblack quant. suff.; melt by heat, mix. Apply with flannel daubers, removing as much as possible with clean woollen rags.

Hexagonal Wire for Nuts.

MODEL writes:—"Referring to reply to A. F. S. (*Dresden*), p. 95, permit me to say that a short time ago I required some $\frac{5}{16}$ inch nuts, and not being able to procure hexagonal wire, this is how I proceeded: I chucked a piece of good iron, about ¾ inch diameter and 2¼ inches long, in my back-geared lathe, and turned it down to the diameter of nut. I then made a chalk mark on my lathe headstock, near the small cog-wheel (eighteen teeth) and also divided the teeth of the said wheel into threes; then by bringing the marked teeth alternately opposite the mark on headstock, and ran a line along the iron rod by means of a tool in the slide-rest, I thus had six lines marked from end to end of rod, equidistant from each other. I then, without unchucking it, filed away the metal between the lines, making a perfect hexagonal rod. This done, I fixed a proper sized drill in the back centre, and drilled a hole as far as I could into the end of rod, faced and chamfered it and cut it off to the right size by means of a parting tool made from a piece of an old keyway file. By doing this for each nut, I got about a dozen perfectly formed nuts out of two inches of iron. As regards tapping, I tapped mine after I had cut them off, but I should think tapping them in the lathe as good a way as any. I hope this will be of use to A. F. S.; it is very simple, perhaps simpler than it seems."

R. L. J. (*Horsington*) writes that:—"A. F. S. (*Dresden*) can get hexagonal or octagonal wire for nuts of Messrs. Davis and Timmins, *Bowling Green Lane, Farringdon Road, E.C.*

Thermometer for Incubator.

FESTINA LENTE.—See reply to R. H. H. (*Alford*), in page 93 of this Volume.

Cigar Cock.

H. G. (*Darwen*). Your question has been already answered in the reply given to a correspondent on this subject in page 493, Vol. III.—D. B.

Cutting and Polishing Pebbles.

J. N. writes:—"I am sorry to know that you appealed to me in your October Number fruitlessly upon the above subject. Ill health must plead my apology for the delay both to yourself and to A. N. I send you again the address of the lepidary, as you request, for the use of any amateur interested in this subject, but cannot do so for publication—vide page 391. I fancy you may be wrong, however, in there attributing the objection to an excess of modesty, and should rather consider it an indication of old world, and somewhat fossilized, notion, perhaps not unnatural in a naturalist; and where good workmanship is in question, a crotchet of little moment. The more pardonable, moreover, in this case, as the artizan is a great invalid, which upsets many of us! There are two active sons in the business, nevertheless, so that any orders will meet with all dispatch." [I am now in a position to send the address of the lepidary to any correspondent who will enclose an envelope duly stamped and addressed to himself.—ED.]

Strong Glue for Veneering.

SAVOIR FAIRE sends the following recipe: —To every pint of the best light brown glue, free from clouds or streaks, add ¼ gill of best vinegar and ½ oz. of isinglass.

Birdlime: How to Make it.

I. R. H. (*Pickering*.)—The following is a recipe that has been given for making bird-lime: Boil the middle bark of the holly seven or eight hours in water, drain it and let it lie on the ground for two or three weeks, covered with stones until it is reduced to a mucilage. Beat this in a mortar, wash it in rain water, and knead it until it is free from extraneous matter. Put it into earthen pots, and in four or five days it will be fit for use. An inferior kind may be made, it is said, by boiling linseed oil for some hours until it becomes a viscid paste.

Wood Stains.

SAVOIR FAIRE writes:—"The following have been published by a German paper as formulæ for some wood stains which may be put up in dry form, and when wanted for use may be readily dissolved in water.

"OAK.—Five kilos. of Cassel brown, 0·5 kilo. of potash, and 10 kilos. of rain-water boiled together for one hour. The whole strained through a linen cloth, and the clear, dark-coloured liquid boiled to a syrupy consistency." [For the benefit of those who do not understand the Metric system, it is necessary to explain that a kilo., or kilogramme, is equivalent to 2 lbs. 3¼ oz. avoirdupois, or, to be more precise, 2 lbs. 3 ozs. 4·38 drams.—ED.]

"WALNUT.—A decoction of Cassel brown, 3 kilos.; potash, 0·3 kilo.; and water, 7 kilos; the whole strained through linen, and brought by evaporation to syrup, 2·5 kilos. of extract of logwood added.

"MAHOGANY.—A decoction of extract of Brazil wood, 3 kilos.; potash, 0·25 kilo.; and water, 3 kilos.; to which before evaporating to syrup, 150 g. of eosine are added.

"EBONY.—Five kilos. of extract of logwood boiled with 11 kilos. of water; and when near the syrupy state, 300 g. of iron nitrate added; evaporated to a syrup under constant stirring. All the above stains are brought into a dry condition by running the respective syrups into trays of sheet iron with low rims, in which the syrup hardens, and is afterwards broken up and ground.

"The above stains were forwarded to me by a friend thinking they might be of some use to me; and knowing there are frequent inquiries for stains by different correspondents, I thought perhaps some of these might do. They are, of course, on a rather larger scale, but could be reduced if required. Should anyone try them, I would feel obliged by the results being given at a later date; also, I should like to know what Cassel brown might be, as I conclude it has a different name to English ears." [Cassel brown is a colour prepared from a native peaty earth, and derives its name—like Cologne brown—from the locality in which it is obtained and prepared.—ED.]

Crystal Varnish.

SAVOIR FAIRE sends the following recipe: —Equal quantities of Canada balsam and oil of turpentine. Warm balsam until quite fluid, then add turpentine. Shake mixture for a few minutes until thoroughly mixed, then place it in a moderately warm situation for a few hours. Ready for use next day.

Patterns for Headstock.

SIGMA.—I always assume that castings will be bought because pattern-making is a trade of itself, and I pity the founder who has to cast from home-made patterns. Moreover, castings can be bought far cheaper from lathe-makers, because they are made in quantity. You get also the best metal.—J. L.

Beech for Plane-Making.

SIGMA.—Any carpenter, wheelwright, or —if you reside in Buckinghamshire, the "home of the beeches"—any chairmaker, will let you have a piece of beech suitable for the purpose you have in view.

Organ Building.

ASBESTOS.—It is possible to build an organ having Open Diapason with Stopt Bass on the Great, and Lieblich Gedacht and Flute on the Swell, with two octaves of Bourdon pedals, in a space of six feet wide, two feet deep, and eight feet in height; but the depth would not include the projection of the keyboards. The soundboard should be about 4 feet 6 inches long and 12 inches wide, divided into two by partitions between the channel bars. The swell must be either a gridiron or box swell, so as to take as little room as possible. The pedal soundboard should be at the back, with the Bourdons placed in a double row, as described in my article on Pedals. Some of the largest Bourdons would require doubling or mitring in order to keep the height within 8 feet. The larger pipes of the manual stops must be planted off at the ends or brought to the front, for the same reason. The organ would be improved by Coupler Swell to Great, either in unison or octaves, and Coupler Great to Pedal, or Swell to Pedal. Another 8 foot stop on the Great would also be desirable.—M. W.

BALBUS.—It is impossible to lay down a hard and fast rule with regard to the number of stops which should be placed in an organ intended for a room of a given size. So much depends upon the voicing and wind pressure, and also on the scales of the pipes. Under the circumstances which you mention it would be quite possible to build an organ having all the stops you require without its being overpoweringly loud. The fact of the instrument being in a recess would somewhat subdue the tone, and if each individual stop were voiced soft, and the wind pressure kept down, it might be possible to put on full power without bad results. The best reed stops to have would be the Oboe and the Clarinet, made as light as possible in tone. The Open Diapason on the Great ought properly to be of full compass, as that stop gives the foundation tone of the instrument. There is no objection to arranging the action of the swell in the manner you propose, and having it connected to the lower manual. Your plan of making a small bellows and soundboard in order to experiment before commencing on the organ, is a good one, and I followed the same plan myself. You will, however, find that a very small bellows will cause the pipes to quaver a little, but you will still be able to get a fair idea of the quality of the tone. As regards your other suggestion, see reply to W. C. (*Greenock*). The hydraulic motors made for organ blowing would be the best to use.—M. W.

W. C. (*Greenock*).—On referring to p. 224, Vol. II., you will see that the end ribs of the feeders are all to be 5¼ inches wide, the size marked on Fig. 40 in the preceding page being an obvious misprint. If you follow the instructions, as to setting out, you will find the feeders will work all right. I propose shortly to give instructions in making reed and metal pipes.—M. W.

TREMOLO.—In the absence of further information, I am unable to explain why you have failed to get the glue to adhere to the leather in your bellows. Did you follow the instructions by using the glue thin and boiling hot, giving the leather at least two coats, and well rubbing down after the leather was put on so as to squeeze out all superfluous glue? I think you will find that the fault was in the manipulation, and not in the material. The editor has suggested that Le Page's Carriage Glue would be the best to use. Judging from the account given of this glue in "Notes on Novelties," I should think that it would answer very well, but I cannot speak from experience. With regard to your statement, that the room in which your organ is to be placed is very damp, may I venture to remark that it would be very unwise to place it where there was even a suspicion of damp; damp being very likely to have a very bad effect on the action, and, indeed, on almost every part.—M. W.

OBOE.—See latter portion of reply to W. C. (*Greenock.*)—M. W.

G. E. H. (*Forest Gate.*)—See reply to W. C. (*Greenock.*)—M. W.

Fishing Rods.

H. W. T.—Arrangements have been made to include instructions for making fishing rods at home in the papers on "Fishing Tackle: its Materials and Manufacture," by Mr. J. Harrington Keene.

Wood Engraving.

H. S.—A skilful engraver on wood can earn a good income. But it is impossible to give a more definite answer to your question.

Russian Perpetual Stove.

CLERICUS.—I will make inquiries about this stove. It is new to me, and I am sincerely obliged to you for putting me "on the trail."

Skinning Tails of Small Quadrupeds.

OLD WATTY.—It is impossible to impart the knack of this operation in words only, but with *care and patience* you will overcome your difficulty. It will be well to have your small animals as fresh as possible. The skin of a mouse's tail slips off with the greatest ease whilst it is warm from life.—G. W.

Ice House for Storing Fish.

A BUTCHER writes:—"Your reply to W. L. (*Cullercoats*) in this month's AMATEUR WORK (December) respecting ice safes, is not quite clear to me. If W. L. cannot succeed with an air-tight box with ice, how is it that scores of London butchers can keep their meat a fortnight in the hottest part of summer. I understand they are made to stand in tho shop above ground. They are made air-tight, and a space between the wood of about six inches filled with sawdust, to keep hot air out. If you could get a personal inspection of some butchers in London, and give the result in AMATEUR WORK, I have no doubt you would oblige a great number of readers. I enclose sketch of an American cooling room." [I am obliged to you for the sketch of the cooling chamber. The external air must enter the cooling chambers used by butchers every time the door or window, as the case may be, is opened to put in or take out meat. The average temperature in these chambers is far lower than that of the air without. I will endeavour to comply with your suggestion, but some little time must elapse before I can do so. —ED.]

Double and Single-Threaded Screw.

R. W. J. (*Horncastle*).—With reference to the specimen submitted, the small end is, as near as I can make it, 17·6 threads per inch, and the *apparent* pitch of the large one is the same. This proves that the same chaser has been used, at least in *finishing* the large one But the actual pitch of the large one is $\frac{17\cdot6}{2}$, or twice that of the small one, which proves that R. W. J. is correct in his opinion, viz., that the large end is double-threaded. The double-thread is a fairly good specimen of work which R. W. J. needn't deprecate. It would, I dare say, be interesting to many amateurs, if R. W. J. would give his *modus operandi*. It is easy, too easy in fact, to cut a double-thread of *half* the chaser pitch, but not so easy to cut or strike one *double* the chaser pitch, at least on "purpus." Did R. W. J. use a pitch striker, or chaser of double the pitch, or did he *start* the thread with the same chaser? It can be done thusly, but if he used the latter method, he, as an amateur, deserves just credit.—OLLA PODRIDA.

Rotary Nuts for Screw-Cutting Lathes.

OLLA PODRIDA comments on the remarks of A. F. S. (*Dresden*) on the above (see "Self-Centring American Chucks," p. 100) as follows:—"I am surprised to hear that lathes fitted as described by A. F. S. are in modern manufacture, and of 18 inch centres! Certain buyers must be easily pleased. I should be sorry if compelled to use such primitive tools in any shop of mine. Such an arrangement I would not tolerate even in a 4 inch lathe, but an 18 inch—well, where must CHEMNITZ be?" And yet A. F. S. has the audacity to imply that we are behind the times! I am glad we are not with CHEMNITZ time. Lament not, A. F. S., that there are "no" such importers of such tools here. As to the shapers, with which you are so sympathetic, such things are getting grey over this way. We are not yet so reduced as to be obliged to have recourse to Baden for modifications of American tools, or English either, for that matter.

Bell for Electric Alarm.

TWIST DRILL writes:—"In page 550, Vol. III. of AMATEUR WORK, there was a reply to B. H. J., describing a way of fitting an electric alarum to a clock. For amateurs who may wish to fit one up, I can recommend a bell sold by the Economical Electric Supply Association, in parts, at 1s. (without battery). It is really a very good one for the price, and easily fitted together. It is handy to be able to get the platinum wire and foil for connections in small pieces, and some of your readers might like to have an alarum who would not give 6s. or 8s. for a bell."

The Cabinet Maker.

F. H. (*Clifton*).—I do not know "The Cabinet Maker's Guide," but there is a monthly publication called "The Cabinet Maker and Art Furnisher," issued monthly, at 6d., at 5, *Finsbury Square, London, E.C.*, which is probably the work you are inquiring for.

Bookbinding.

AMICUS.—You will find the paper for which you make inquiry, namely, "Home-made Tools for Bookbinding," in Part II. of AMATEUR WORK. Your notice for Sale and Exchange Department came into my hands on Nov. 20th. I get another letter from you on Dec. 3rd, expressing regret that it did not appear in the Dec. Part. You have not considered that its appearance in this Part was absolutely impossible, as the sheets composing the Part were printed before your notice reached me. I keep the Sale and Exchange Department open to the latest possible moment, and have, as you will have seen, perhaps, recently adopted the plan of stating date of closing, that correspondents who send notices after the date named, may understand why they do not appear.

Sewing Books for Binding.

F. H. (*Crigglestone*).—Instructions for the above process will be found in the papers entitled, "Bookbinding for Amateurs," given in Parts 6, 8, 10, 12, 16, 18, and 21 of this magazine, and in a paper, headed, "Home-made Tools for Bookbinding," in Part 11. You had better take advantage of the offer of AMATEUR WORK made in our Sale, Purchase, and Exchange Department, and acquire a complete set of the work.

Velocipede Fret-Saw.

ROSELEA writes :—"I should like to elicit from those who may have used it, a little more information regarding this Velocipede Fret-Saw. From the illustration in page 92, it looks as if the tension of the saw was derived from a leather strap, and not from strained arms as is the common way. If this be so, it opens up a new principle, and one which I think has many advantages. I have seen this plan in the regular 'trade' machine, but from the fact that no amateur machine seemed to be similarly constructed, I was led to conclude that some difficulty lay in the way of its application to the smaller article. With the saw held between two strained arms the cut was always the segment of a circle; and if the arms were of any length, the saw itself was not too steady. If some of your clever contributors can give an idea how to adapt this belt as the 'strainer,' it would be possible, I think, both to secure a more exactly perpendicular cut, and also a much steadier motion."

Saws for Fret-work.

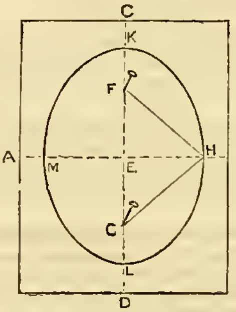
YOUNG AMATEUR.—You must choose your saw in accordance with the thickness of the wood and the intricacy of the pattern you are about to cut. Use fine saws for thin wood, and coarser saws for thick wood, and if your pattern be a complicated one involving many turns in a restricted space, use a fine saw, and three-ply fretwood, as described in "Notes on Novelties," page 92 of the current volume.

Rigging Model Fore and Aft Schooner.

H. J. (*Lisbon*) appeals in Vol. III., page 391, for instructions for rigging a fore and aft schooner. In page 550 of the same volume, A. C. H. (*Bristol*) kindly volunteers to supply information on the subject, provided that it is a *model* schooner, to which H. J. (*Lisbon*) refers. H. J. (*Lisbon*) writes again to say that absence from the city in which he resides has prevented him from referring to the answers to his inquiry. He says that it is a *model* boat to which he refers, and hopes that A. C. H. (*Bristol*) will give the proffered instructions on this subject. If this meets the eye of A. C. H. (*Bristol*), I have pleasure in saying that if he will send me one or two papers illustrated with the necessary diagrams, I will find room for them at as early a date as I possibly can.

Oval Wood Mount.

F. H. (*Clifton*).—You ask for instructions for making a perfect oval mount in wood, with chamfered edge for a small frame. The whole matter is easy enough. First obtain your wood, which you can get from Mr. Gus. Rochefort, 29, *Basinghall Street*, if there is no frame-maker or cabinet-maker in your own town of whom you can procure it. Then comes the tracing of the oval. To do this, when you have determined the greatest length and the greatest width of the oval or ellipse to be described, trace on the wood two straight lines, A B, C D, intersecting each other at right angles in the point E. Then mark on C D the greatest length K L, and on A B the greatest width M H. Note that E K, E L each = ½ K L, or greater length; and E H,



SMALL OVAL MOUNT.

E M each = ½ H M, the greatest width. The next step is to take the compasses, and opening the points to a distance equal to E B and E L, place one leg on H, and with the other strike arcs intersecting K L at F and G. At each of these points insert a pin into the wood, and attach to them a piece of fine twine, so that the length of the twine from F to G when lying loose shall be exactly equal to K L. Then, having brought the twine to its utmost tension by extending it with a pencil or a tracing point, describe the curved lines, A H L, L M A on each side of K L. The result will be a perfect oval, which is what you require. Having got this oval, trace another slightly within the oval, K H L M, cut out this second oval with a fret-saw, and then bevel away the edge from the line K S L M to the lower edge of the oval cut away by the fretsaw. This is the simplest but most accurate method for you to follow in carrying out the work you have in hand.

Coaguline.

SAVOIR FAIRE sends the following recipe:—Swell 1 oz. of isinglass in water for twenty-four hours; pour off water, and add 2 ozs. of spirits of wine; warm till dissolved (beware of fire), then add 1½ oz. of thick mastic varnish, and mix thoroughly.

Tracing Paper.

FENMAN.—Any stationer can procure tracing paper or tracing cloth for you, although he may not keep it in stock. If, however, you find any difficulty in getting it in your neighbourhood, apply to Messrs. Letts, Son & Co., Limited, 33, *King William Street, London Bridge, E.C.*

Type-founding.

FENMAN.—J. R. (*Ballater*) will shortly supply further information on this subject. Type metal is composed of lead and antimony in different proportions for different kinds of type. For the very smallest type, three parts of lead are used to one part of antimony, and the proportion of lead is increased as the type gets larger, until for large and soft type seven parts of lead are combined with one part of antimony. Common type metal consists of nine parts of lead to one of antimony. Of course, the greater the proportion of antimony the harder the type. You cannot get moulds for casting type, if you want them you must make them for yourself. Type metal you can easily make from the details given above.

Catch for Card Case.

GALLIA.—You can get such a catch as you describe from any ironmonger who supplies fittings for fretwork cabinets, etc., and small articles of this class. Write to Messrs. Harger Brothers, *Settle, Yorkshire*, Mr. J. H. Skinner, *East Dereham, Norfolk*, who, without doubt, keep all things of this kind.

Treatise on Pianoforte Tuning.

T. B. T. (*Carnew*) wishes to state for the information of the readers of AMATEUR WORK, that "The Art of Tuning the Piano," by Joseph Warren, price 1s., can be had from Messrs. Cocks & Co., *New Burlington Street, London, W.*

Griffin's Mitre Machine.

A DEAL TABLE writes :—"I shall be much obliged if any of your correspondents can tell me why Griffin's mitre machine will not make a true angle of 45°; it goes well for about two-thirds of the way, and then makes a slight bend, which prevents a proper joint being made." [If your machine is well and truly made, it cannot fail to cut the wood at a true angle of 45°. From what you say, I am inclined to think that you do not exert an equal pressure on the cutting chisel throughout the whole of the stroke. If you inadvertently, and perhaps, unconsciously, relax the pressure in the direct line of the cut, and press directly downwards on the top of the handle, even to a very slight degree, there would be a tendency to throw the edge of the chisel upwards, and the surfaces of the bevels, being thus slightly hollow, an imperfect joint would be the result. I think the fault must lie in your method of going to work, and not in the machine itself.

Boot and Shoemaking.

I. R. H. (*Pickering*).—Articles on this subject appeared in Parts 1, 2, 3, 4, 7, 9, 10, and 21. You had better provide yourself with a complete copy of the magazine. You will find many good offers respecting it in our Sale, Purchase, and Exchange Department.

Substitute for Screw Press.

WATTO sends us the following "wrinkle" from *Singapore, Straits Settlements*:—"Herewith is a dodge I found in a Chinese carpenter's shop here, which answers capitally instead of screw-presses, and which may be produced at a minimum of cost and trouble. Take two pieces of stuff, 6 feet by 3 inches by 1 inch; lay them together, and down the centre at every six inches (or less, if you please) drill holes with a three-quarter inch centre-bit; next, square the holes with a chisel, and then make two square pins, which shall fit the holes easily. The length of these pins should be about 1 foot. Your work is now done. Now for the way to use it. For simplicity of description I will call the two pierced pieces the runners, and we will imagine that you are going to press two pieces of inch board, each 9 inches wide, after they have been matched and glued. Put one pin through

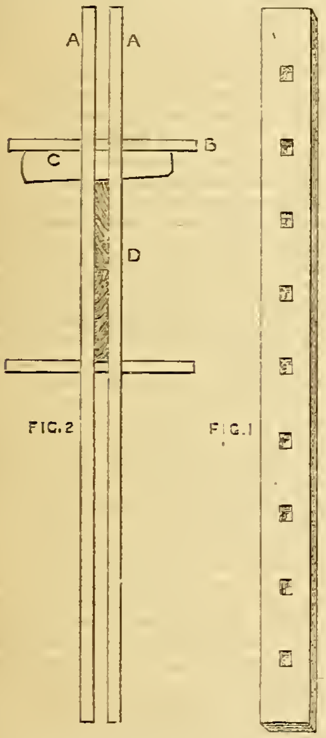


FIG. 1.—SIDE VIEW OF RUNNER.
FIG. 2.—SECTION OF PRESS IN ACTION.
A, A, Runners; B, B, Pins; C, Wedge; D, Work in Press.

both the runners, and wedge it, leaving a space of one inch between them; then insert your work, put the other pin into the holes nearest the other edge of your work, and, inserting a wedge between the pin and the work, drive it home, and your boards will, of course, be driven close together. This 'Heathen Chinee' way of doing business has one advantage besides its simplicity over our English presses; it is impossible for the work to bulge, being held as it is by the runners on each side. John Chinaman is a very fair carpenter, and has many little dodges of this sort, which I shall be glad to describe if you think they would interest your readers. I enclose a sketch of what I have tried to describe, which may make my meaning clearer." [We are all much obliged to you for the trouble you have taken. By all means let us have some more of John Chinaman's dodges in carpentry. —ED.]

Watch Repairs.

J. T. (*Newcastle*).—OLLA PODRIDA writes in reply:—"To clean plates and pivot holes of watches use essence of lemoine. A small bottle costs one shilling. Apply it with a camel-hair brush. Keep the bottle well stoppered or corked, as, in addition to being very volatile, the essence is also highly inflammable. It dries quickly on application, after which the pivot holes may be cleaned with pegwood, sold for the purpose at twopence per bundle. The wood must be sharpened to a fine clean point. A very keen knife must be employed, to avoid 'fur' on the wood. To clean the holes the peg is inserted and twirled round in them. The essence, as also pegwood, may be obtained from Morris Cohen, 132, *Kirkgate, Leeds*. I have done my best to help you thus far, but as it is out of my line I cannot undertake papers on Watch Repairs."

Mouldings for Panels of Etagère.

H.—You say that you are constructing one of Adams and Bishop's fretwork designs, in which there are several panels of inlaid work, and that you want a small neat moulding to finish them off, the moulding to be $\frac{7}{8}$ inch in depth. You send me a piece of moulding of the shape and size shown at A, this representing a section of it. You wish for something lighter in appearance. This lightness of appearance can best be obtained, I think, by hollowing out the face of the moulding in the manner shown at B, which will not look quite so stiff, perhaps, as that at A. You will have to make your mouldings for yourself; but as they may be turned out in short lengths, the panels being 7 inches square, you will not find much difficulty in doing this. Having made the moulding as shown at A, the hollow may be taken out with a narrow gouge, the wood being securely held down by clamps or any other contrivance, so that it may remain immovable during the operation. The moulding is so very small that you would find a difficulty in working the face of the moulding with a router, as in the Substitute for the Stop-Chamfer Plane, described in Vol. III., p. 442. You will not be able to purchase mouldings on so small a scale, at all events, I have never met with any; but if you were inclined to be content with mouldings of the shape shown at A, you might purchase some of the thin gilded slips used by picture-frame makers for making a flat inner framing between the picture and the moulding of the frame itself, and then carefully cut away the bevelled edge with a cutting gauge to serve as your moulding.

SECTIONS OF SMALL MOULDINGS FOR PANELS.

Preserving Skins.

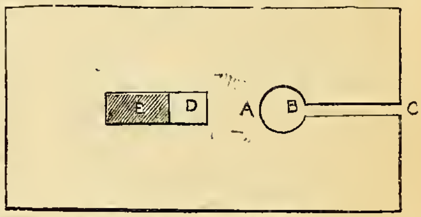
I. R. H. (*Pickering*).—Arsenical paste is sufficiently powerful in itself to cure the skins of birds and animals. Bécœur's Arsenical Soap, which is used for this purpose, is composed of the following ingredients: Camphor, 5 drachms; arsenic, 4 ozs.; white soap, 4 ozs.; carbonate of potash, 12 ozs.; air-slaked lime, 4 ozs.; the whole made into a stiff paste with a little water.

Lenses for Magic Lanterns, etc.

W. F. (*Dundee*).—I cannot tell you the "best place" for getting lenses for magic lanterns and cameras, but if you will turn to the "Amateur Work Trades' Directory," given monthly in our advertising pages, you will find the addresses of many dealers in magic lanterns and photographic apparatus, who can supply you with what you want if you explain your requirements carefully to them.

Support for Wood in Fret-Sawing.

A. A. writes:—"I have been doing fretwork for over five years, so perhaps you will excuse me for writing about cutting boards, but having tried them in their various shapes, my experience may be of some value. The opening shown by G. T. W. P. has one fault, it allows small work, such as the ends of match boxes, to slip off the board, the result being either a broken saw or broken work. The hole, in fact, should be as small as is convenient, so as to support the fretwork just round the saw. This is necessary because the saw will sometimes become clogged with the sawdust and will not move (beginners experience this most), and as this happens at times without any notice, a thin piece of work is very liable to break, unless well supported round the saw. I find the best board is made by boring a hole, A B, with a one inch centrebit about 2 inches from the edge of the board, and from that cutting a $\frac{3}{8}$ inch channel, B C, to the edge of the board, with the grain. This channel will be quite large enough to admit the top of any ordinary frame, and the circular hole will answer for all that aperture, B, on G. T. W. P.'s board is designed. The best way to fix the board is to screw it down firmly with three or four screws; but for those, who, like myself, have found that schoolmasters and parents do not agree with the above method, the only way is to fix the board by means of a cramp. This should be of metal. The board should be of sufficient thickness to allow the cramp, when put through the hole, D, to be just below the surface at E, which is mortised about half through the board."



BOARD FOR FRET SAWING.

Lens for Camera Obscura.

G. R. (*Brighton*).—Write to any of the optical instrument makers, or makers of photographic appliances, whose names appear in the pages (in Trade Directory in the red advertising pages) of Amateur Work. Mention the diameter of the lens yon require, or tell them the pnrposc for which yon require it, and ask them to suggest a suitable size, and inform yon of the cost, carriage paid.

Recipe for Cementing China.

Iago Cybi.—The receipt for making cement for joining broken china—namely, quicklime mixed with white of egg, or isinglass dissolved in acetic acid, is well known. A Resident in the Highlands, however, does not ask for a cement for china, but how to "clasp" pieces of broken china together, that is to say, how to join the pieces by rivets. You offer to send a copy of an illustrated article on the subject, that has appeared in another magazine. Anyone who happens to have the magazine in question can do this, but this would be "poaching on another person's manor." What is required is instructions on riveting china given from personal experience; in other words, strictly original and not second hand.

Narrow Gun Barrel.

Mercury Orkney.—Yon ask "how to remedy a gun barrel that has become narrow in the middle of the inside, or rather, which has been drilled wider at the muzzle, which causes it to scatter the shot owing to the ineqnality of the bore. The gun is not twist barrel, and it is not worn with shooting, for it is nearly new." You can do nothing yourself to produce uniformity of gauge from muzzle to breech. Take it to a gunmaker, who will examine the barrel, ascertain its thickness, and tell you if it is possible to effect this by reboring. If the boring was properly done in the first instance, it is difficult to account for the present condition of the barrel. In all probability it left the maker's hands in a fanlty state.

Wheel Barometer Dials.

Mercury Orkney.—If you look in the advertising pages of Amateur Work, you will find in our Trades' Directory the names of firms who are opticians and makers of philosophical and scientific instruments. Write to any of these: they will doubtless be able either to supply you with a dial for a wheel barometer, or to get one for you. But why not make one for yourself, if yon have access to one from which you can copy the gradnation, etc.

Instantaneous Shutter.

R. N. C. (*Valencia*).—Mr. J. Pocock will give a description of the methods of making an instantaneous shutter in his papers on the "Construction of Photographic Apparatus," now appearing in this Magazine.

Book on Saw-Sharpening.

J. G. F. (*Banagher*).—There is a book, by Holly, entitled, "The Art of Saw Filing," which may be of use to you, but as I am not acquainted with it, I cannot say whether or not it will meet your requirements. Mr. Tayler refers to it in his "Wood-working Machinery for Amateurs," in the chapter on "Scroll and Fret-Saws," and gives diagrams from it, showing the proper positions in which to hold the file in sharpening saws to cnt wood at different degrees of hardness, with some practical remarks on the subject. The chapter is in Vol. I. of Amateur Work, page 499, or in other words, in Part 11, dated October, 1882.

Rudder for Sailing Boat.

E. H. (*Manchester Square*) writes:—"In Fig. 24, page 109, Vol. IV., both pintails are shown on the rudder. The lower one is usually much longer than the npper one, and the lower one should be fixed to the boat (not the rudder). This brings the point of the lower pintail near the surface of the water, and enables the rudder to be shipped with greater facility." [You are quite right: it was an oversight on the part of the draughtsman, to whom the drawing of the diagrams for engraving was trusted, and it escaped observation before going to press.—Ed.]

Connecting Telegraph Instruments.

Telegraph.—The binding-screw lettered z mnst be connected with the zinc of battery, that lettered c with copper or carbon of the same, L is intended to be connected with line, and E with earth. This to be explained in this way for your purpose: Two lines are run between the two instruments—one is marked L for the line, and the other, E, to do duty for an earth-plate. A two-cell Leclanché of the smallest size will serve your purpose on snch a short line, or you may use a line of fine wire, say No. 22, on two cells of your granule battery. By this arrangement you will send the current through the home and distant instrument at the same time. If you nse three wires and two batteries, you can render each independent of the other. See articles on "Electric Bells," page 519, Vol. I., for diagrams on how to connect up in this case. The switch is for the purpose of throwing the bell into circuit, and shonld be left on when the operator is away from instrument.—G. E.

Localities of Advertisers in Sale and Exchange Department.

E. W. S. (*Banstead*).—In compliance with a wish expressed by yourself and other correspondents, I have appended the locality from which each notice in the Sale, Exchange, and Purchase Department emanates, commencing with Part 39, for February, 1885.

Mechanical Stage for Microscope.

F. J. G. writes:—"Having snccessfully constructed a microscope from R. Thomson's excellent instructions, I should feel greatly obliged if he would give sketch and description of a mechanical stage to suit the same. This, I think, would be very interesting to many of ours." [Mr. Thomson has this in hand, bnt he has bnt little time for literary work, in common with many valued contributors to Amateur Work, and hence the delay. His promised paper on this snbject will donbtless soon reach me.—Ed.]

Surface-Plates.

A. F. S. (*Dresden*) writes:—"There seems to be some misunderstanding abont the surface-plates (page 148). Olla Podrida does not seem to take in the fact that I keep one plate sacred as a surface-plate. The other plates that were used in the grinding of it are not very trne, therefore I do not keep them sacred. I grind things npon them sometimes, and when they become very much out of truth, I work them np again. The surface-plate is never ill-used by grinding upon it.

"In answer to Olla Podrida, I mnst refer him to page 545, Vol. III., in which, speaking of surface-plates, he says, 'They should be scraped, and not ground together.' If in speaking of 'scraping,' he means something else, the fault is his, and not mine. I merely asked for my own information.

"Olla Podrida speaks sarcastically of the supposed 'secret.' The fact is that the 'secret' is an expired foreign patent, which I accidentally came across, and which people in England are not likely to know of. The process, from want of tools, does not prodnce a perfectly true surface. The patent expired, I think, upwards of thirty years ago. The reason why I said, 'This part is likely to remain a secret of mine, as it requires things that amateurs in general cannot get,' is that because I know that milling rests are not to be had ready made with angular adjnstments."

India Rubber Bands for Gearing Slide-Rests to Mandrel.

A. F. S. (*Dresden*) writes:—"As regards the rnbber-band gearing (page 150), I have seen a workman turning wooden and ivory twists, the slide-rest being connected by rubber or elastic band to the chnck. I do not know whether it would do for screw-cutting. As regards the merits of home and foreign manufacture, it is the want of solidity that I complain of in cheap English and American goods; I refer only to lathes and planing machines. There cannot be mnch difference as regards design in any conntry. This is not the question. It seems to be impossible to obtain a really good lathe in England for less than £80, the same lathe costing £40 here. Surely there cannot be a difference in value of £40 between England and Germany, the cost of labour being the same?" [The cost of labour, I think I may venture to say, is *not* the same in England and Germany. German clerks and mechanics who come to this country obtain employment chiefly on account of their readiness to work for lower wages than Englishmen in the same position of life can take if they desire to live and thrive. This is "free trade" in labour! Again, it is possible to procure "a *really good* lathe" in England for less than £80, as the price lists of the Britannia Company and other manufacturers will show. Were it not so, I am certain that few amateur mechanics in this country could possess a lathe worth having, for obvions reasons.—Ed.]

Terms of Subscription to "Amateur Work."

A. F. S. (*Dresden*) says:—"It seems to me strange that I cannot find any terms of subscription in your Magazine." If you wish to have Amateur Work sent to you direct from the office, the terms of subscription will be 6s. per annum, *plus* sufficient to cover book-postage of the twelve parts issued in the course of twelve months.

Boring Collar and Backstay.

Twist Drill writes :—"I wish to thank Far East for his design for boring collar and backstay, given in Vol. III., p. 533 of Amateur Work. I have made one which is very useful to me."

Address Wanted.

T. C. (*Aldershot*).—You say, "Will you kindly ask for E. P.'s address through the medium of our Magazine?" I do this, but I wish that when correspondents write to ask me to ascertain addresses for them, they would point out the page and volume in which occurs the communication to whose writer they refer. I fail to find any "E. P." in Parts, 34, 35, and 36.

Bichromate Battery.

A. W. W. (*Upper Clapton*).—Lebasi's instructions for making a Bichromate Battery appear in Parts XXVII. and XXXII. of this Magazine. The writer goes fully into the matter of cost in his papers.

Dovetailing.

R. A. P.—You will find instructions for Dovetailing in Part IV. of "Every Man His Own Mechanic." Price 6d.

INFORMATION SUPPLIED.

Dead Black Varnish for Telescope Tubes.

Chemicus writes in reply to H. M. H. :—"Take lampblack, about a thimbleful, and put it on a flat stone or smooth slate; add four or five drops of gold size, and well mix with a palette knife. Make the whole about as thick as putty; well mix. The less gold size there is the better, so that the lampblack just sticks together; if too much gold size be added, the effect will be a bright black instead of a dead black. Now add turpentine about twice its volume to the whole. Mix with a camel-hair brush, and apply to the brasswork.

Support for Wood in Fret-Sawing.

Casenhem writes in reply to M. E. L. (Vol. III., page 551) :—"He uses a wooden screw clamp similar (but larger) to the one illustrated in page 4, for fixing the sawing-board on to his sitting-room table, and finds that answer all requirements."

Catch 'Em Alive.

J. B. (*Stonham*) writes in reply to H. M. H.:—"I have used birdlime with good effect for catching flies. A wooden cross hung from the ceiling will soon be covered quite black with them. It (the birdlime) can, I believe, be obtained at a chemist's."

Chemicus writes in reply to H. M. H. :—"This is made by smearing on paper that has been previously soaked in a solution of alum, the following composition: Melt together 4 ozs. of resin with 1 oz. of linseed oil, and add 1 oz. of honey. I may say that about the safest and effectual fly killer is a sweetened infusion of quassi chips."

Black Varnish for Telescope Tubes.

Savoir Faire writes in reply to H. M.H.: —"Vegetable black and thin French polish, mixed so that it may run freely from brush, makes a suitable varnish for the interior of a lantern. This recipe was given in the 'English Mechanic,' by Mr. Lancaster, in answer to a correspondent. So I conclude it is a good one."

Electrical Locomotive.

J. T. (*Exeter*) writes in answer to R. L. J. (*Horsington*) :—"I beg to submit the accompanying plan and following description: The foundation is a piece of wood (deal will do) 6 inches by 3 inches by $\frac{1}{4}$ inch. A hole $2\frac{1}{4}$ inches by $1\frac{1}{3}$ inch must be cut, $\frac{3}{4}$ inch from the side, and $1\frac{7}{8}$ inch from either end, for the wheel G to revolve in; G may be of wood, size $1\frac{3}{8}$ inch broad, and $1\frac{7}{8}$ inch diameter. F F, are four pieces of iron, $\frac{1}{8}$ inch by $\frac{1}{4}$ inch by $1\frac{3}{8}$ inch long, screwed on to G. H is the axle, which must be of metal, brass will do. D is the wheel of four cogs for breaking contact with the spring C (Fig. 1). A A′, B B′, are two horse-shoe electro-magnets. E E are metal standards for G and its fixings to turn on. J and K are two pulley wheels, J fixed on H, K on the axle of left front wheels. The *axles* of the wheels *must* be disconnected, as shown (Fig. 2), else the current will short circuit through them. First fix the magnets as shown in Fig. 2, so as to allow sufficient room for the wheel G to turn in between, allowing about $\frac{1}{16}$ inch each side of the bars, F, F. G must be fixed with the standards, E, E, of the right height, so that an imaginary line drawn from the centre of A′ to centre of B′ (Fig. 1) will pass

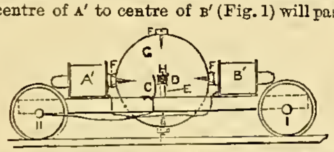


FIG. 1.—ELECTRICAL LOCOMOTIVE—Elevation.

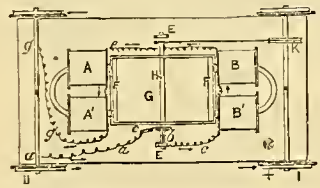
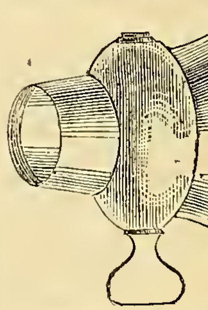


FIG. 2.—ELECTRICAL LOCOMOTIVE—Plan.

through the centre of G. The contact-breaker D must be fixed on H in the position shown in Fig. 1. A hole must also be cut to allow the band to pass from J to K (Fig. 2). The wire is connected as follows: the current comes through the wheel (Fig. 2) through axle, where connection must be made through wire A A, to the contact-breaker C to the wheel D, then through G to the standard A′, then on through C C to coil B′, then B, and on through E, E, E, to coil A, and by F to A′, through G G to the other wheel, and so to the rail. This can, I think, be clearly followed in Fig. 2. The magnets are wound with 28 B. W. G. The rails could be made of thick brass wire about $\frac{1}{8}$ inch diam. This is only the weaker kind of engine, the stronger one having a revolving electro-magnet in the place of G, which greatly increases the power. The battery usually employed with these is a cell of a bichromate. Magnets that will do very well may be bought from Mawson and Swan, 15, *Mosley Street, Newcastle*, at 1s. 6d. I am afraid I have not made it very plain, but I shall be very glad to give you any more information I can. The Editor has my address.—J. T.

Micro-Photography.

C. writes in answer to H. H. B. (*Reading*):—"I append a sketch of an idea which has occurred to me to connect the camera and microscope. One end would screw on to the camera in place of the lens, and the other end on to the microscope in place of the eye-piece. The valve, like that of an ordinary beer-tap would be the dark shutter. I am not a photographer, so I may not see some fatal objection, but I do not see why it should not be possible to use the



CONNECTION FOR MICROSCOPE AND CAMERA.

microscope as the means of conveying the picture to the plate in the camera."

J. P. writes in reply to H. H. B. (*Reading*): —"Take the lens out of its mount, and screw the latter on to your camera. A cone made of any light proof substance, such as waterproof cloth, secured over the lens, mount, and eye-piece of microscope with indiarubber bands will make the thing complete. You can use ordinary gas-light —direct, *not* reflected."

Binding Books by Wire Staples.

R. L. J. (*Horsington*), in reply to A Resident in the Highlands, recommends him to send for Churchill's catalogue of American tools, where he will find descriptions and prices of machines for wire staple binding, from 3s. 6d. to £10 10s.

R. C. H. writes in answer to A Resident in the Highlands :—"I may say that binding by wire staples is done by means of costly machines, the lowest priced one I have seen is sold by Messrs. Selig, Sonnenthal and Co., and I believe costs about £10."

Savoir Faire writes in answer to query by A Resident in the Highlands respecting Binding Books by Wire Staples, I beg to say that if he refers to Harger Bros., *Settle, Yorkshire*, catalogue, he will find an article advertised there which will give him an idea, also price of staples, etc.

Compound Marine Engine for Model Launch.

Olla Podrida, in reply to S. M. L. (*Goderich, Canada*), writes:—"Your requirements are rather heavy. The design of a compound marine engine, even in a simple form, would occupy more time than many could afford. Also, you do not give dimensions of launch and required speed. It is necessary that length of body, draught, or midship section and displacement, and space at disposal for machinery should be given at least. Do you mean

condensing engines, or high pressure compound? If you give these, I could supply you with data in figures of principal details. Is it to be a screw propeller? Is your engine 1 inch bore and 2 inch stroke, or 2 inch bore and 1 inch stroke? You should have stated that clearly, because the cubical capacity depends upon it, and as a natural result, the size of boiler. If you have consulted makers, accept the *largest* boiler they recommend. You will then be upon the safe side for steam supply."

Reconstruction of Organ in Parish Church.

Mr. Mark Wicks writes in reply to Clergyman (*Burton Fleming, Hunmanby*):—"As you invite suggestions from amateur organ builders on the reconstruction of your organ, I tender a few remarks for what they may be worth. If the organ is to be entirely reconstructed, I would suggest that the CC compass should be substituted for the GG, and that a pedal bourdon should be added. Another 8 foot stop, such as a Dulciana, would improve the manual stops; the Principal and also the Open Diapason would be better if metal throughout. A pedal coupler and an octave coupler on the manual (which latter would entail twelve additional channels in the soundboard for the extra pipes) would give extra power and brightness. A general swell over all pipes, except the stop which may be brought to the front, would allow variety in power. The sham front should be abolished, and a speaking front substituted. The side cases might also be abolished, and the space filled by the Bourdon pipes. The bellows should have double feeders, and should be as large as possible, so as to secure a good supply of wind for full power. I give these suggestions on the assumption that it is intended to retain such of the old pipes as may still be fit for use, and not to add greatly to the size of the existing instrument.

Boot and Shoemaking.

T. J. O'C. (*Manchester*), in reply to G. P. (*Manchester*), sends a letter for G. P., which shall be forwarded if G. P. will send name and address.

Gregorian Reflecting Telescope.

G.K. writes in answer to H. M. H.:—"You are in error as respects the speculum. Steel has nothing to do with it, it is an alloy consisting of two parts of copper, one part of tin, with the addition of a small quantity of arsenic to increase its whiteness. In process of time the speculum becomes tarnished from an infinitely fine film of oxides on its surface, which can only be removed with great care as there is great danger in altering its curve by mechanical processes, and one of the best means is by the use of a weak solution of oxalic acid, but even this is a dangerous experiment. Having a very old Gregorian Telescope in my possession, the speculum of which was unexceptionally good as respects curvature, I made many experiments to restore its brilliancy with ultimate success. There are, no doubt, hundreds of these instruments, as well as those of the Cassegranian form, which are now useless from the loss of brilliancy, but which may, at a very trifling cost, be rendered serviceable, if not for delicate astronomical observations at least for educational purposes and amusement. If H. M. H. would like to send his instrument to me for examination, if not too far oxydised, the speculum will be restored and immediately returned, no expense being incurred but the carriage to and fro. The Editor has my address."

INFORMATION SOUGHT.

Re-Tinning Glue Pot.

Edwardus writes:—"I shall be glad if anyone will advise me the best and easiest way to re-tin the inside of my glue pot? I have burnt the tin out of mine, and consequently it rusts and the glue sticks to it."

Amber for Varnish.

W. B. (*Gainsborough*) wishes to be informed where he can buy amber for varnish? and the price at which it is sold? also, the best way to dissolve the same?

Varnish Hardening.

J. B. (*Stonham*) writes:—"Being in want of some white hard varnish for carved work, I made some according to a receipt given in Amateur Work, of gum sandarach, rectified spirit, and turps, which answered beautifully, and I was greatly pleased with it, but not using it for a month, I was surprised to find it had all turned thick and formed in a mass at the bottom of the jar in which I kept it covered up, and quite useless. I have heated it, and also added more spirit and turpentine, but to no purpose. Can any reader tell me why it turned so, and whether I ought to strain it and keep it in a corked bottle? I may add the varnish was standing in a cold room, in which there was no fire at any time."

Paint for Golf Balls.

H. M. D. writes:—"I will be greatly obliged to any reader of Amateur Work who will tell me what kind of paint is used for painting golf balls, and also, how it is applied. I have tried common white paint, but it always comes off immediately when used. The way I put it on was as follows: I poured some of the paint on the palm of my hands, and then rolled the ball in them. Was I right?"

Covering Copper Wires.

Flashing Dynamo asks:—Is it possible for amateurs to cover their own wires on a lathe, or is the covering machine an expensive one?

Best Chuck for Model Engine Work.

S. M. L. (*Goderich, Canada*) writes:—"Will any reader kindly name the most useful chuck for model engine work; also, an easy way of chucking small discs of brass and eccentrics. I have had a good deal of trouble in trying to get a fairly finished article. Had to solder eccentrics to brass face-plate, then turn disc, remelting solder at least half a dozen times, then the hub had to be turned up; it seems to me a good deal of trouble, and time would be saved if a chuck could answer."

Model Steam Gauge.

S. M. L. (*Goderich, Canada*) writes:—"I wish to make a model steam gauge that will work well. Will be obliged if some brother amateur can help with a drawing of one, say ¾ inch dial."

Publishers of Text Books on Mechanics.

S. M. L. (*Goderich, Canada*) asks:—"Can you give me the names of one or two houses in London who publish mechanical text books, etc? also, on what subjects does the following book touch, 'The Boy Engineers,' (written by Lukin, I think.") [Crosby Lockwood, and Co., *Stationers' Hall Court, E.C.*; Trubner and Co,, *Ludgate Hill, E.C.*; Longmans', *Paternoster Row*; and many other firms publish text books on mechanics. But without knowing exactly what you require, it is difficult for me to give you information that might be really useful. The book you name would touch on mechanical work, without doubt, but I am not acquainted with it.—Ed.]

Copper Boilers for Models.

S. M. L. (*Goderich, Canada*) asks:—"Will some amateur mechanic give me a sketch each of vertical and horizontal copper boilers for models. I would like to know which gives the most satisfaction with spirit lamps, and if soft soldering is good enough for, say engines of 1½ inch to 3 inches."

Petroleum as Fuel for Models.

S. M. L. (*Goderich, Canada*) writes:—"I will be glad to know if any amateurs have tried petroleum as a fuel instead of methylated spirits for working model engines, and with what results?"

Chucks Used by Amateur Model Makers.

S. M. L. (*Goderich, Canada*) writes:—"Will some amateur kindly give me a list of all the chucks generally used by amateur model makers."

Cheap Hinges for Screens.

Veto asks:—"Can any amateur give his experience in making screen without the patent hinges, which are very costly? The ordinary iron hinge only allows the fold to open one way, and does not stop all the draught."

French Polish Reviver, Glaze, Stopping, etc.

J. W. T. (*Kingston-on-Thames*) would be glad to know whether any of the readers of Amateur Work will tell him how to make a good Reviver for French Polish; also, what glaze is used for mouldings, etc., which cannot be touched with the French polish—whether it has to be mixed with polish, etc.; also, how to make a good stopping for holes in veneer. He may mention that he has followed the directions on "French Polishing," in Amateur Work, and can now polish fairly well. [With regard to deep mouldings, see reply to Amateur Cabinet Maker, Vol. III., page 546.]

Ornamental Top for Arched Folding Screen.

Veto suggests:—"Perhaps Mr. White, or some kind friend, will be able to give a fretwork design for screen top. The carved ornaments come in very expensive to buy retail."

Paper for Chinese Lantern.

H. S. wishes to know what kind of paper is used for making Chinese lanterns, and if it is creased by machinery or not? He will be obliged to any correspondent who will tell him how they are made.

Varnish for Violins.

S. F. C. (*Liverpool*), writes:—"Will W. F. W. (*Birmingham*) kindly state how he made the oil varnish for violin, or if purchased where it can be had and the price. Perhaps he will also point out the recipe for spirit varnish, given in AMATEUR WORK, so I and others may avoid using it for violin. L. T. (*Abergavenny*), might give us a wrinkle in varnishing.

Ink Stains.

F. A. E. (*Newtownbutler*) asks:—Can anyone tell me what will remove ink stains from linen? Some time ago I saw tartaric acid recommended, but find it of little use unless the linen be left steeped in it for several days.

Indiarubber Rings of Patent Washing Machine.

F. A. E. (*Newtownbutler*) asks:—Can any of your readers inform me of any preparation which would make the indiarubber rings upon the ends of the rollers of a patient washing machine contract? Owing to the hot water used in washing they have become distended, and are constantly slipping off.

Gilt Paper Bordering for Screens.

VETO wishes to be informed where he can procure gilt paper screen bordering, very narrow, that will varnish; and how screens are generally bordered with leather.

Removal of Varnish from Brush.

AJAL asks:—"Can anyone inform me what I should use to remove old varnish that has hardened in brushes and pots? I have tried soaking them in new varnish, but have not succeeded in softening them." [Try Rendle's "Electric Paint Remover," for removing paint, varnish, japan, wall-paper, grease, tar, rust, etc., from wood, stone, iron, marble, etc., manufactured by Messrs. Rendle Bros., 3, *Westminster Chambers, Victoria Street, London, S.W.* Price, per 5 lb. tin, 2s. 6d.—ED.]

Amateur's Overmantel.

F. H. (*Clifton*) writes:—"I, and, no doubt, many other readers, would be glad if BRUM would give us particulars and drawings of the 'Overmantel' he has made, and which he mentions in Vol. III., page 435; and also give the name and addresses of the manufacturers of Lincrusta and silvered plate-glass, with the prices of the various articles, if he is able to do so." [If this meets BRUM's eye, he will oblige by replying.—ED.]

Gas Bag for Lime-Light.

PHYSETER wishes to know how to make a gas-bag, such as is used for lime-light.

Lamp for Bath Heater.

HYDROPATHIST asks:—Can any reader of AMATEUR WORK give me some information how to make a cheap and useful apparatus to heat water for a bath, by gas or oil lamp?

Addresses in Edinburgh.

A DEAL TABLE asks:—Can anyone tell me of a place in Edinburgh where picture-frame mouldings may be bought; such a place, for example, as George Rees, in *London?* also, a place in Edinburgh where carving tools, such as those described in AMATEUR WORK a month or two ago, can be bought? It is a great addition to the cost if everything has to be sent from London.

Colours for Sketching Entertainments.

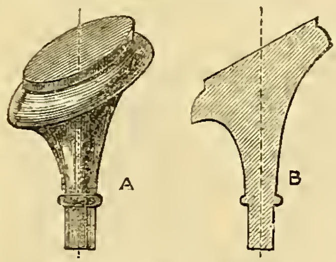
BERT H. writes:—"I wish to procure some colours like those used by Mr. J. W. Binn (late of Royal Polytechnic) in his sketching entertainments. Could you tell me where to apply? If they are not produced commercially, how are they prepared?" [The colours to which you allude must be coloured crayons of a large size, and capable of producing a broad and well-defined stroke. They are used very commonly in lecture rooms and schools in America for diagrams and demonstrations on the blackboard. Personally, I cannot say if they are to be bought in this country, or, if so, where. About ten years ago an American gentleman put the very same question to me, and said he had been inquiring for them all over London without success.—ED.]

Double Fret-Saws.

IAGO CYBI asks:—Can anyone tell me where to get these saws? They have teeth on the two edges. I believe they are to be got somewhere in London. The address with price per dozen and per gross will greatly oblige.

A Query for Turners.

ENQUIRER writes:—"Can any contributor or reader tell me how to *turn* the form shown in the annexed illustration? The



KNOB WITH SLANTING TOP.
A, Perspective View; B, Section.

plane surface at the top is inclined at an angle of about 60° to the perpendicular drawn up and down. Can it be done. A solution of the problem will be gratefully received."

Photography of Microscopic Objects.

R. N. C. (*Valencia*) writes:—"I have a small photographic camera and a microscope, and I wish to know if these can be utilized to photograph microscopic objects, and if so, how?"

Anemometer.

ARVONIA writes:—"I am desirous of measuring the *velocity* and power of the wind. Can any brother reader give me a sketch (workable) for making a meter for this purpose, which shall be reliable? I am open to very strong winds from the N. and N.W. off the sea."

"Graph" that does not want Washing.

ARVONIA asks:—Will any reader please tell me how to make a "Graph" that will not require washing? I am told one can be made which, after being used, takes in all remaining ink, and in a short time is again ready for use. How is it made up?

REPLIES DEVOID OF GENERAL INTEREST.

C. F. (*Leeds*).—Your suggestion shall have attention. Are you inclined to write yourself on the subject? If so, I shall be glad to hear from you again.

J. M. M. (*Blyth*).—One of the contributors to AMATEUR WORK has now in hand a design for the subject about which you write.

SALE, PURCHASE, OR EXCHANGE.

Persons availing themselves of this Department of AMATEUR WORK *are requested to note that—*

(1) *No Trade Advertisements can be inserted in this Department, which is open to bonâ fide Amateurs only. The Editor reserves the right of refusing to insert any notice.*

(2) *No charge will be made for the insertion of notices until their number be such as to render it absolutely necessary to do so.*

(3) *Persons writing in reply must forward application under cover to the Editor, in an envelope sealed down, with a Penny Stamp attached in the upper right hand corner, and the* NUMBER *of the notice in the lower left hand corner thus:—*

STAMP here.
NO. OF NOTICE here.

(4) *Letters thus marked and enclosed under cover to the Editor will be forwarded immediately to owners of articles for Sale or Exchange, or persons wishing to purchase. No attention will be paid to any communications in which these Rules are not strictly observed.*

(5) *It is desirable that those who reply to notices in this Department should enclose to the advertiser, with their application, a stamped and directed envelope, in order to ensure a reply. When this precaution is not taken, the non-receipt of a reply within reasonable time can only intimate that the article in question is disposed of, or that the proposal made is declined.*

*** *It will be noticed that in this month's issue, I have appended to each notice in this Department the* LOCALITY *from which it emanates. This has been done in compliance with the wishes and suggestions of many readers, and I am of opinion that the course adopted will be to the interest of both buyers and sellers. It will prevent, for example, any buyer from commencing a correspondence which may end in nothing on account of the distance that intervenes between his place of residence and that of the seller, and the consequent cost of carriage in some cases; and as most buyers like to examine an article before purchasing it, the knowledge that the locality in which it is to be found is not very far off, may lead to a personal visit for inspection, and thus tend to facilitate the sale of the article offered.*

236. Foot Lathe, back-geared, compound slide-rest, centre from 3 in. to 4½ in. Must be in perfect order. State lowest cash price, dimensions, etc. (*Glin, Co. Limerick.*)

237. "Engineering," Weekly Nos., July to Dec., 1878; Jan. to July, 1879; April 30 to Dec. 31, 1880; 1881 complete; Jan. to Aug., 1882; all in good condition; cost 85s. Offered in exchange for AMATEUR WORK, Parts 1 to 35 inclusive, clean and perfect, and Mitre Machine, or any other useful article. (*Ulverston.*)

238. Bench Lathe, 4 in. centre, 3 ft. bed, 3 speed driving pulley, ⊤ rest; all iron, never been used. Price 24s. (*Southsea.*)

239. "Science for All."—Vols. I., II., III., unbound, offered in exchange for AMATEUR WORK, Vols. I., II., III. (*Westminster.*)

240. Wooden Clamp, for holding Picture Frame Moulding while nailing, with iron hooks and bell-metal thumb nuts. Price 2s. (*Ashford, Kent.*)

241. "Every Man his Own Mechanic," bound, or in parts. State price, etc., and condition. (*Cambridge.*)

242. Spon's "Workshop Receipts."—Wanted to purchase, in good condition. (*Cambridge.*)

243. Castings for Marine Engine, Oscillating double cylinder, ¾ in. bore with screw, bed and bearing plate, 4 columns; cylinders bored and flanges turned. Worth 7s. Will take 5s., or exchange for Bichromate or Smee Battery, or Small Coil. (*Godalming.*)

244. Patent Oak Graining Machine, Bellamy's, cost 16s, will sell for 8s. (*Luton.*)

245. Camera and Dark Slide.—Mahogany, 5 in. by 4 in. By Cox. 10s. (*Luton.*)

246. Repeating Back Camera, for taking two pictures on one plate. 6¼ in. by 4¾ in.; rack and pinion focussing arrangement, two dark slides, one never been used. Price 25s. (*Luton.*)

247. "Amateur Work," Vol. III.—Will sell cheap or exchange. (*London, N.*)

248. Telescope and Opera Glasses.—What offers in exchange? (*London, N.*)

249. Two Organ Key Boards, full compass, not pairs, second-hand. Price 40s. for the two. (*Wolsall.*)

250. Printing Frames, for Blue Printing Process, 9½ in. by 4¼ in., of shape described in p. 497 of Vol. III. of Amateur Work. Price 8d. each. (*London, W.*)

251. "Knowledge," Vols. I. to IV. Will exchange for "English Mechanic" from April, 1883. (*London, W.*)

252. Bellows' Body Camera —Half plate, nearly new, with vertical and horizontal motions, swing front and back, with folding stand. Will take £3. (*Lockerbie, N.B.*)

253. Boiler wanted, to drive ⅛-horse power easily. Must be cheap. (*Swalwell, Co. Durham.*)

254. Working Drawings of Horizontal Engine.—2¼ in., or 2¾ in. bore, and about 4 in. stroke. Wanted to purchase; must be cheap. (*Swalwell, Co. Durham.*)

255. Silver Watch, by Russell. Value £3. Will exchange for Double Breech-loading or good Muzzle-loading Gun. (*Lisnaskea, Co. Fermanagh.*)

256. Breeding Cage for Canaries.—24 in. by 18 in. by 11 in. Price 5s., purchaser to pay carriage. (*Lisnaskea, Co. Fermanagh.*)

257. Books Wanted.—Amateur Work, Parts 24 to 36; "Science for All," Parts 8 to 14; "Encyclopædia Dictionary," Parts 3 to 10. Will give cash. (*Addiscombe.*)

258. Books for Sale.—"Technical Educator," Vol I.; "Knowledge," Nos. 1 to 30. What offers? (*Addiscombe.*)

259. Organ Key Board, 5 octaves, nearly new, perfect condition. Price 26s., purchaser to pay carriage. (*Brompton, York.*)

260. Continuous Drawing Paper, very stout, 60 in. wide, about 12 yards. Price 2s. 6d., purchaser to pay carriage. (*Brompton, York.*)

261. "Universal Instructor."—Complete in 3 vols., quite new. Will sell for 7s. 6d. each, or exchange 2 vols. for Vols. I. and II. of Amateur Work, and take 6s. 6d. for remaining volume. (*Old Hill, Drogheda.*)

262. Dick's English Library.—3 vols., containing about 20 novels. Will sell for 3s. 6d., or exchange for books on Building Construction. (*Old Hill, Drogheda.*)

263. Musical Goblets.—Perfect set in case, consisting of over two octaves with all the semitones. Will sell for £6, or exchange for Ross's Whole Plate Rapid Symmetrical, or Dallmeyer's Rapid Rectilinear Lens. (*Maidstone.*)

264. Music Printing Outfit.—By Jeberz Francis; will print several copies in an hour, and is invaluable to bands. Cost 15s. 6d. Will sell for 10s., or exchange to value of 15s. (*Graigue, Co. Kilkenny.*)

265. "Amateur Work."—Wanted, second-hand and cheap, back Parts from Part 12 to Part 35 inclusive. (*Birkenhead.*)

266. Books for Exchange.—"Boy's Own Paper," Vols. IV. and V., and Cassell's "Household Guide," Vol. I., unbound and clean. Will exchange for Tools or Electrical Sundries. What offers? (*Lewes.*)

267. Books for Sale (No. 1).—Amateur Work, Parts 13 to 37, clean and perfect, 6s. Cassell's "Universal History," 40 Parts at 7d., 13s. Both carriages paid. Or will exchange: what offers? (*London, N.*)

268. "Amateur Work."—32 Parts in good condition, 8s. 6d., or offers; purchaser to pay carriage. (*Brighton.*)

269. Books for Sale (No. 2).—About 12 Parts of Amateur Work for 1882, 1883, in pretty good condition, and about 80 Nos. of "Boy's Own Paper," for 7s. 6d. Purchaser to pay carriage. (*Braintree.*)

270. Electric Apparatus and Castings for Lathe.—Electric See-Saw, cost 15s.; Electric Swing, cost 13s.; Set of Castings for 2½ in. centre lathe, heads bored, bed-planed and v'd, cost 15s. All the above offered for 35s. (*Wilsden, near Bingley.*)

271. Cassell's "European Butterflies and Moths," well bound, good condition, 61 coloured plates. Cash price, 30s. (*Wilsden, near Bingley.*)

272. "Amateur Work."—Parts 1 to 30 inclusive, wanted. Must be clean and in good condition, with all plates. State lowest price. (*Durham.*)

273. "Amateur Work."—For Sale, half-price, Parts 1 to 37 inclusive, clean and perfect. Purchaser to pay carriage. (*Carlingford, Co. Louth.*)

274. Fishing Tackle.—1¼ gross Artificial Flies, assorted variety and size; 2 gross Hooks, various makes and sizes; 2 dozen coils Gut and Hair Lines; 60 feet of Cord Line on large Reel with Swivels, etc., and 2 floats, all in good condition. Will exchange for Magic Lantern, 3¼ in. condensers, rack and pinion adjustment, etc. Sciopticon preferred; or what offers? (*London, W.*)

275. "Practical Lessons in Landscape Painting in Oils." By Grant.—Wanted to purchase a second-hand copy. Must be in fair condition and cheap. [*Send your name and address, which you have omitted to supply, quoting number of your notice, that I may send you any letters received in reply.*—Ed.]

276. Bicycle Adjuncts.—Pouch, Screw Hammer, Oil Can, Plated Alarm Bell, to be disposed of; what offers? (*London, N.*)

277. "Amateur Work."—Wanted, Parts 1 to 17 inclusive, also Part 28. Must be in good condition and cheap. (*Manchester.*)

278. Picture Frame Mouldings.—Three 12 feet lengths, handsome and quite new; also a quantity of Glass. Price 1s. 6d. (*London, N.*)

279. Horizontal Bar.—Solid ash, 6 feet long, 1¾ in. in diameter, square ends, thoroughly seasoned; scarcely used. Price 2s. 6d. (*London, N.*)

280. Old Violin.—Wanted, cheap, for cash. No objection to one out of repair. Also some seasoned maple and pine, suitable for violin-making. (*Woodbridge.*)

281. Stencil Designs.—50 selected, suitable for decorators, full size. Price 2s. 6d. for the set, or 1d. each. (*Frankford, King's Co.*)

282. Six Inch Centre Lathe, back geared, heavy slide-rest with swivel top slide, 3 ft. 6d. bed, dovetail planed, two treadles, double action crank, 3 speed heavy fly-wheel, 5 speeds on cone, set of Morse drills to fit hole in nose, face-plates, chucks, and tools. Price £10 10s. (*Corbridge-on-Tyne.*)

283. Castings for Fret Machine, bevel table, cheap; what offers? (*Corbridge-on-Tyne.*)

284. Bath Heater.—Wanted, good and efficient, to heat up to 100° Fahr., 30 to 40 gallons; must be cheap. (*Glasgow.*)

285. Venetian Blinds.—Five, repainted (green), varnished and re-taped, equal to new. Sizes: (1) 5 ft. 5in. by 3 ft. 2 in.; (2) 5 ft. 9 in. by 3 ft. 2 in.; (3) 5 ft. 6 in. by 3 ft. 6 in; (4 and 5) 6 ft. by 3 ft. 9 in.; what offers? (*Glasgow.*)

286. Chemistry as Applied to the Arts and Sciences.—32 Parts, new, clean, and complete. Will sell or exchange for anything useful. Offers requested. (*Penmænmawr.*)

287. Electric Appliances. — Covered Copper Wires. 2 lbs. No. 22, double cotton covered, for 5s.; 2 lbs. No. 26, cotton covered, at 2s. 9d.; 1 lb. No. 36, silk covered, 9s. 6d.; 2 Electric Bell Pushes, at 6d. The lot for £1, or will exchange for 4 in. or 4½ in. Lathe Castings, or good Fret Saw Machine. (*London.*)

288. Riddell's Carpenter, Joiner, and Hand Railer.—Cost 45s. Quite new. Will sell and pay carriage for 23s. (*Holyhead.*)

289. "Amateur Work."—Parts 1 to 39 inclusive, complete and perfectly clean. What offers, cash or exchange? No live stock. (*Wisbech.*)

290. Violin and Bow in Case, full size. Price 21s. Can be seen in the City. (*London, E.C.*)

291. Microscope.—Students, 2 powers, in neat box, with various glasses, etc. Cost 12s. 6d.; will exchange for Vol. III. of Amateur Work. (*Sale, Cheshire.*)

292. American and Australian Periodicals.—Clean back numbers of the chief American and Australian journals, such as "Harper's Weekly," "Puck," "Illustrated Australian News," "Review of Science and Industry," "Australasian Sketcher," etc. Will forward full particulars to any address. (*Gainsborough.*)

293. "Amateur Work."—Wanted, Vols. I., II., III., unbound, clean, and complete, and carriage paid to London. Must be cheap. (*New Barnet.*)

294. Vertical Tubular Boiler, made of best boiler plate, riveted, tested to 100 lbs., fitted with safety valve, water gauge, stop cock, valve for force-pump, and 3 taps. Height 2 ft. 2 in., diameter 12 in., on iron base. Quite perfect, used about six times; what offers? (*Ross, Herefordshire.*)

295. Books, various, unbound. — (1) "Universal Instructor," new; (2) "Scientific Recreations," good as new; (3) Cassell's "British Battles," in fair condition; (4) Cassell's "Mechanical Dictionary," Nos. 1 to 20 inclusive. Cash offers requested. No reasonable offer refused. (*Bolton.*)

296. Materials, etc., for Organ Building. —(1) *Paper Pipes*: 32 Keraulophon, C^1 to G^3; 41 Open Diapason, E to G^3; 8 Stop Diapason, EE to B; 21 Leiblich Gedacht, DD sharp to B; 21 Violoncello, E E to B. Part painted and finished. Also 49 Flute, G to G^4, painted and voiced complete. The whole, 7s. 6d. (2) *Bellows*: Pair double-feeder inverted rib, 24 in. by 54 in.; capacity about 9 cubic feet. Price 20s. (3) *Soundboard*: 5 stop, 60 in. by 29½ in., built to combine Great and Swell; 62 channels, C C to C sharp, 30s. Also supply of paper, leather, mandrels, etc., free. All the above are quite new, and greatly under cost price. Advertiser would take even less from immediate purchaser, as he is going abroad. (*London, N.*)

297. Photographic Camera, with 2 diameter double Achromatic lens, by Solomon, tripod stand, glass bath, 3 toning dishes, bath meter, etc., etc. Will exchange for Organ work in good condition. (*Ringwood, Hants.*)

*** List closed January 7th.

COMMUNICATIONS AWAITING REPLY

Mabuta, J. L. D. (*Fulham*), Dom Bedos, Bing, Dull Razor, J. A. B. (*Stomford Hill*), C. C. B. (*Northampton*), Delta, S. W. O. (*Croydon*), Dawlish, F. W. G. (*Tunbridge Wells*), Festina Lente, Tuba, Twist Drill, W. B. (*Sale*), J. P. K. (*Cheltenham*), C. E. F. G. W., C. W., C. R. W., J. C. (*Ireland*), W. W. (*Norwich*), Olla Podrida.

List closed Jan. 7th, 1885.

A CHEAP ELECTRIC BELL BATTERY.

By GEORGE EDWINSON.

SINCE the invention of the peroxide of manganese battery by the late Georges Léclanché, no other generator of electricity has superseded it for the special purpose of furnishing such an intermittent current as that required for the occasional ringing of electric bells. But when several bells are placed on one circuit, and one or more of them are in action all through the hours of each day and night, the manganese fails to supply enough current to meet the increased demand; and, in such cases, recourse must be had to some other form of battery. In most cases the Daniell form of cell is found the best for continuous work through a circuit of high resistance, but it is rather troublesome to maintain in working order through any prolonged length of time, on account of the well-known tendency of the copper salt to creep out of its cell by exosmotic action into the zinc compartment of the battery and over all the connections of the elements. Hence users of electric bells on a large scale have sought out other generators, and, as a consequence, we bave the double fluid chromate batteries of Fuller, Anderson, Poggendorf, and Dale; all good batteries in their own special province.

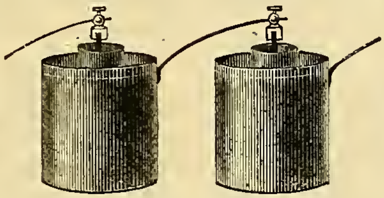


FIG. 1.—BENNETT'S TIN POT BATTERY—TWO CELLS IN SERIES.

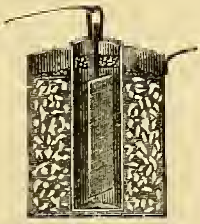


FIG. 2.—SECTIONAL VIEW OF TIN POT CELL.

FIG. 3.—WIRE CLIP USED AS SUBSTITUTE FOR BINDING SCREW.

But all those forms of battery necessarily demand an outlay of several shillings, in the requisite pots of porous earthenware and stoneware, and a still further expenditure in elements and ingredients, whilst a not infrequent deterrent to the out-of-the-way amateur exists in his isolated position away from towns where the requisites of those batteries are to be obtained. Such persons will be glad to know how to make up a cheap battery out of homely materials at a merely nominal cost, and I am equally pleased to be able to render them some assistance.

The materials for this battery are as follows: 1. Any number of any size of old tin pots or cans, such as meat tins, fish tins, milk tins, or even old iron or tin saucepans or publican's pots—any of these will do if they do not leak, and if they leak they can be easily soldered. 2. A quantity of iron turnings or borings. 3. Some caustic soda or caustic potash. 4. Some scraps of canvas and iron wire. 5. Some strips of roofing zinc, or any other form of zinc. 6. Some pitch, or some paraffin wax. 7. A few bungs or large corks, and some bits of copper or brass wire.

Now let us take these articles in detail, for the purpose of arranging them in order for selection.

1. *Tin Pots.*—The best variety for our purpose are those that have been formed with clamped joints before soldering, and the worst are those with purely soldered joints, since the caustic alkali is able to dissolve solder. However, if the best cannot be easily obtained, we must protect the solder inside the cans with a coating of melted pitch or of Brunswick black applied whilst the tin is warm, and after it has been well cleaned. The tin pots will be used as outer cells for the battery, and should therefore be selected nearly of a size throughout the number of cells employed in the battery. We shall get the same pushing power, or electro-motive force, from small cells as from large ones; but the large cells will give a greater volume of current, and must be employed for large bells and instruments with large magnets.

2. *Iron Borings.*—These supply the place of the peroxide of manganese in the Léclanché cell, and are made to occupy the space between the inner and outer cells of the battery The best are those obtained from the lathe of a metal turner, but in this case see that they have not any brass or copper mixed with them. Next to this, any old scraps or small pieces of iron or steel will do: for instance, old tinned tacks, broken nails of all kinds, bits of iron wire, provided it is not galvanised wire; and, if these materials are not available, any old scraps of tinned ware may be cut up into little bits, and utilised for the purpose, taking care not to have them too large, so as to sit loosely in the tins.

3. *Caustic Alkali.*—The best alkali for this purpose is that of caustic potash. Next to it, in point of value, with only a fraction less suitability, is that of caustic soda. Much has been said in AMATEUR WORK already about this latter article and where it can be obtained, so I shall confine my remarks to the home manufacture of this, and of potash. Common washing soda, nor soda cake, nor common potash, nor pearlash, nor best American potash, will serve our purpose here, however suitable they may all be for other purposes, but washing soda, and washing potash and pearlash, and American potash may be easily converted into the caustic variety of each of those alkalis, and the operation can be safely done over the kitchen fire in

an old iron saucepan or iron crock, pot, or any other iron vessel. It must not be an enamelled vessel nor a tinned vessel, for the caustic alkali will readily dissolve both while the solution is hot, and copper is also liable to be acted upon by the caustic alkali. To make caustic potash, we should employ best clean pearlash or washing potash, *i.e.*, potassium carbonate (a compound of potassium and carbonic acid), obtained from the ashes of sapwood and tender plants in the following manner: The ashes are mixed with water, and the mixture is strained through a rough sieve, consisting of small twigs and straws laid across the bars of a wooden frame. The liquid is preserved and heated in iron pans until all the water has been driven off, when the residual salt is dried, and is sold as grey pearlash. This grey pearlash is put into iron pans in a furnace, and calcined—that is, highly dried to redness to drive off any organic matter contained in it—when it is known as crude potash or rough pearlash. This is further purified by dissolving it in a little water, again straining the liquid through canvas, and heating it in iron pans, with frequent skimming, until it crystallizes into purified pearlash, or white pearlash, used by some housewives as a substitute for soda. To convert this into caustic potash we proceed as follows: Into a clean iron pot or pan must be placed a solution of pearlash containing one part of pearlash to ten parts of water; and this solution must then be raised to boiling point. Whilst it is getting hot, slake some good lime in warm water, and mix water with it until it has become like thin cream (cream of lime); then cover the vessel, and keep it covered. Now get an iron spoon or ladle, and take some of the cream of lime from the covered vessel, and put it into the boiling potash solution. Allow this to boil up again for two or three minutes, then add another ladleful of cream of lime; again allow to boil, and thus proceed until it has been judged that one part of lime has been added to each part of potash in solution. Then take out a ladleful of the liquid, pour it into a vessel, and allow it to stand for a minute or so, or until the sediment has subsided; then decant it into another vessel, and add a test of equal parts muriatic acid (spirits of salts) and water. If now the solution fumes and effervesces much, more lime must be boiled with the potash, and the tests must be repeated until the mixture of acid and water produces little effect on the solution of caustic potash. The boiling solution must then be stirred, closely covered, and allowed to simmer for a quarter of an hour, after which time it may be allowed to cool, and the clear liquid decanted off into green glass bottles stoppered with glass. Let the potash boil up after each addition of lime, and add water from time to time to make up that expelled in boiling; if this is not done, the solution will spoil.

Caustic soda is made in a similar manner, by using a solution of one part of washing soda to five parts of water, and adding to the boiling solution one part of lime slaked in three parts of hot water. The details of the process and the manner of testing are precisely similar in both; but caustic soda usually takes up less time and care to prepare it, than does that of caustic potash. The properties of those caustic alkalies are also very similar. Whilst hot they will dissolve lead, tin, zinc, and all enamels or glass containing lead, they will also act on copper and brass. In the cold state they will dissolve cork, tin, zinc, lead, earthenware containing alumina, and all animal substances. If spilt on the skin they will cause painful sores, and will even dissolve warts and corns, sometimes leaving wounds instead. Their use in soap-making is well known, and the amateur can easily convert his waste fat into soft soap by the use of caustic potash, or into hard soap with caustic soda.

4. *Porous Cell.*—A porous cell to contain the solution of caustic alkali, and to form a compartment for the zinc element of the battery, is a necessity, for although this is practically a single fluid battery, its action is similar in every respect to that of a double fluid battery, and the nature of the fluid itself renders a porous cell necessary. If the caustic fluid is not contained in a porous cell properly prepared to receive it, the fluid absorbs carbonic acid from the air, and becomes converted into a solution of carbonate of soda, and thus rendered useless.

The best material for a porous cell, is red porous earthenware, such as flower-pots are made of, and cells of this ware in all sizes are made by potters, and sold by dealers in electrical materials at a cheap rate. The white porous variety contains more alumina, and is rendered less suitable for the purpose. To prepare the porous pot for its duty as a cell, the upper part for a distance of one-third from the top must be rendered non-porous, and the best method of doing this is as follows: Melt some paraffin wax in an old saucepan, warm the porous pot and dip it into the melted wax once, and again, until the wax has fully soaked into all the pores in the upper part of the pot, then allow it to cool. The next best method is to warm the pot as before, and coat it inside and out to the required depth with melted pitch. Those amateurs who cannot get a porous pot or cell may make one of canvas and iron wire. First, make a canvas bag of the required diameter and height to suit the tin outer pot—that is to say, for a tin pot 6 inches by 4 inches, the bag should be 6½ inches by 2 inches, and so on in proportion, allowing just one inch of space between the sides of the two cells, and allow the porous cell to overtop the other by ½ an inch. When the canvas bag is made, secure it to a light frame of

iron wire so made as to support it on the outside and preserve it in the form of a round cell, if this form be adopted, or in any other form to match the contour of the outer pot. To this frame sew the canvas bag, stitch it neatly around the top, then treat it to paraffin or pitcb, as recommended for the cell of porous earthenware, with tbis addition, well soak the bottom of the canvas bag, to a height of ½ inch, in the protective material.

5. *The Zinc Element.*—The electric current from this battery is produced, as usual, by the decomposition of zinc. This metal is therefore the positive element of the battery, and it dissolves in the solution of caustic alkali, absorbing the oxygen therefrom and liberating the hydrogen, and thus forming oxide of zinc, or "zinc white" in tbe porous cell. When the battery was first discovered, it was thought that it could be made to produce oxide of zinc in paying quantities, and thus the current be generated for nothing ; but sucb a desired result could not be hoped for by amateurs. Tbick roofing zinc may be used for the zinc plates or cylinders, or zinc rods may be employed ; but in whatever form zinc is employed, it must not be amalgamated with mercury, and it is best to have it in massive form, for the action of the current soon cuts througb the plates at the water line. A thin tang of tbe plate or rod sbould be formed on top to penetrate tbe covering of the cell, and to form a connection above tbe cover.

6. *Protective Material.*—As causic alkali attacks all animal and several mineral substances, we cannot employ paraffin candles, for those contain stearine and otber fats, neither can we employ varnishes made up of mineral oxides and fatty oils. Pure solid paraffin is the best material, then pitch, or perhaps asphalte. This protective material is put on to prevent ingress of air to the solution of caustic alkali and to prevent tbe caustic salt from creeping out.

7. *Covers, Connectors, etc.*—It is necessary to seal the zinc element into the porous cell with an air-tight cover. Tbis may be done by cutting a new cork bung to fit the cell, bore this to receive the tang of the zinc element, soak tbe bung in melted paraffin or in pitch, and seal it together with the zinc in the porous cell, after this has been charged with the solution of caustic alkali. A wooden bung may be carved out as a substitute, and tbis may be baked and then soaked in paraffin, whilst hot. It is then best secured air-tight in the cell by a ring of rubber around tbe edge, and then all covered with paraffin or pitch. A copper wire may be soldered to the tin pot to form a connector between this and the zinc, for the tin pot itself will form tbe negative element of each cell. The copper wire from the tin pot of one cell must be attached to the zinc element of the next cell, and this may be done by means of a brass binding screw or with a simple clip of stout copper or brass wire, such as that herewith illustrated.

The various parts of each cell of the battery must be put together as herein described. First, charge the porous cell with the solution of caustic alkali, put in the zinc and seal it in air-tight, as before directed. Then put the charged porous cell in the centre of the tin pot cell and fill up the spaces between their sides with the iron borings. Pack these in well, but do not ram them down tight nor seal over the top surface of them with any substance Connect the tin pot of one cell to the zinc of the next, and so on with the next in series one after the other, until enough battery power bas been obtained. The inventor (Mr. Bennett) claims for it a power or electro-motive force slightly less than that of the Léclanché cell, and a greater capacity for continuous work. If properly made up and the right quality of caustic alkali employed, the inventor's claims may be readily sustained by amateurs. It is not necessary to put any solution of caustic alkali into the outer cell with the iron borings, as these soon become sufficiently moistened with the solution that slowly percolates through the pores of the inner cell ; neither the iron borings nor the tin pot will rust whilst moist with the caustic alkali, and they are thus practically everlasting, not needing any change. Not so, however, the inner cell and its contents. The zinc will dissolve and the solution become exhausted in a period of time represented by days, weeks, or months, according to the current demanded from the battery or the care taken in making up the cells. Then, new zincs must be procured, the "zinc white" cleaned out of the cells, and these freshly charged with caustic alkali, and again sealed. In tbis way the battery may be made and maintained at a small cost for first outlay, and such a small expenditure afterward as to merit the name of "Bennett's Cheap Battery."

A VIOLIN ON THE GUARNERIUS MODEL.

By EDWARD HERON-ALLEN.

II.—BACK AND BELLY—NECK AND SCROLL—CONCLUSION.

BACK AND BELLY.—The slabs prepared for these being all in one piece, you will not have to join them. It is, however, very important that the entire slab have an even grain all over, not close at one edge and wide at the other, as is the case if the slab has been cut from a small tree. It consequently sometimes happens that a piece of wood may be excellent across all its breadth, excepting for the last inch or so. In this

case, the outline model being placed upon it, the lower bout will overhang one edge (or, in other words, the wood will be too narrow for the model). This may be remedied as follows: Roughly trace the outline on the wood, marking on the edge the part which is too narrow; you can now, with a bow-saw, cut out a little strip from inside one of the C's, and making both surfaces plane, glue it edge-wise to the edge where the narrowness is apparent. If necessary, you can do this on both sides of the slab; the pieces thus added matching exactly in grain, and being well joined, their presence will be undiscernible under the varnish, especially when further hidden by the purfling, and by this means you will be able to utilize a slab of wood acoustically and otherwise desirable, that without this expedient you could only use for a smaller instrument, if at all. Your plates being of a proper size, make one side quite plane, as described in p. 405, Vol. II. If you are working a slab (as I am presuming you are), the back plate will be of a nearly even thickness throughout, so can be marked at once; but if it is to be a "whole" back, it will be a long, thin wedge, as in Fig. 5, and must be cut away on one side as there shown (saving the slips thus got, as I have said before, for the ribs), and the tables prepared for marking, as in p. 405, Vol. II. (Fig. 31). You can now mark the outlines by means of the model, Fig. 3, marking one half of the outline, and then turning over the model and marking the other (unless you have a *whole* outline model). This being done, cut it out as carefully as you possibly can, as before set down (p. 405, Vol. II.) Then shape the model or arching of the back and belly with gouge, oval planes, and scrapers, exactly as before, using the arching models 1A, 2A, 3A, 4A, 5A in the *Folding Sheet*, which are the arching models of the characteristic Guarnerius pattern we are working at, and are the same for both back and belly. (It will be remembered that for the Stradiuarius we used different arching models for the back and belly.) The points at which the arching models must fit the tables are shown by the numbers at the short lines across the centre line on the mould. When the rough gouging is done, gauge a line round the edge of the plates (*i.e.*, perpendicular to the plane surface), as described in p. 405, Vol. II., $\frac{5}{16}$ inch from the flat side, and with the gouge and oval planes fine down the rounded surface with the models. Then gauge again another line $\frac{1}{6}$ inch from the flat side, and with a knife pare down the edge (so as to form a bevel on the arched side) to this uniform thickness all round; then with an oval plane plane round the edge of the arched surfaces so as to melt this bevel into the arching you have already got, still working and correcting with the models. Now with a file smooth round this outer margin of the arched side, and make a groove and melt it into the arching, as described in p. 406, Vol. II. This done, finally get the arching on both plates *exactly* to coincide with the models, and your plates will be ready to scrape. This is done as before described (p. 407, Vol. II.), scraping, wetting, and re-scraping until the requisite degree of smoothness and equality has been attained. Now mark the *ff* holes according to the pattern shown in Fig. 10, which represents the pair of *f f* holes belonging to the Guarnerius fiddle we are now making. Both *ff* holes and their position in the belly are shown, as the peculiar character of the fiddle in question is that they are slightly different, and one is higher than the other, all very ugly, doubtless, but very characteristic and interesting. Find the exact centres between the upper, middle, and lower bouts, and connect them with a line as set forth in p. 466, Vol. II. Call this line (on the belly) A B. Make an *f* hole model by pasting a tracing of the illustration given in Fig. 9 on to a leaf of veneer, and cutting out the two *ff* holes. Now set this model on the belly with the line A B on the model coinciding with the line on the belly, and trace the two *ff*'s as you did before (p. 466, Vol. II.) Next punch out the upper and lower holes of the *ff*'s as prescribed in the same page, and proceed to gouge out the back and belly to the requisite thicknesses as set down in pp. 407 and 466, Vol. II., planing, scraping, and finishing the edges as before, after which the back will be ready to be glued on. Take the mould (round which the sides are set as they were left awhile back), and setting it on the back, see if the sides fit the back nicely; if they do, you can clean off the lower edges of the sides and blocks, and prepare them for the glue as set down in p. 408, Vol. II., and immediately fit on the back and glue it as there described. It is not, however, impossible that the sides or the back may have shrunk a little, so that the edges do not appear even when the ribs (on the mould) are set on the back; in this case take the ribs off the mould by forcing a table-knife between the glued sides of the blocks and the mould, and carefully easing off the sides. Be sure that the ribs are well separated from the mould before you slip them off. Sometimes, in spite of the most careful soaping, a drop of glue will adhere to the mould, and the ribs will stick to the mould at that point; in this case the rib must be carefully prised off with the table-knife before attempting to slip them off the mould. When slipped off, the ribs must be fitted to the back and glued as described in p. 409, Vol. II. This done, the next thing will be to cut the remaining or upper halves of the top and bottom blocks *only* to shape in the same way as the lower halves were, shaping them exactly so as to be *quite* perpendicular to the plane of the fiddle; then proceed to put in the upper side linings. This is done exactly as the lower ones were,

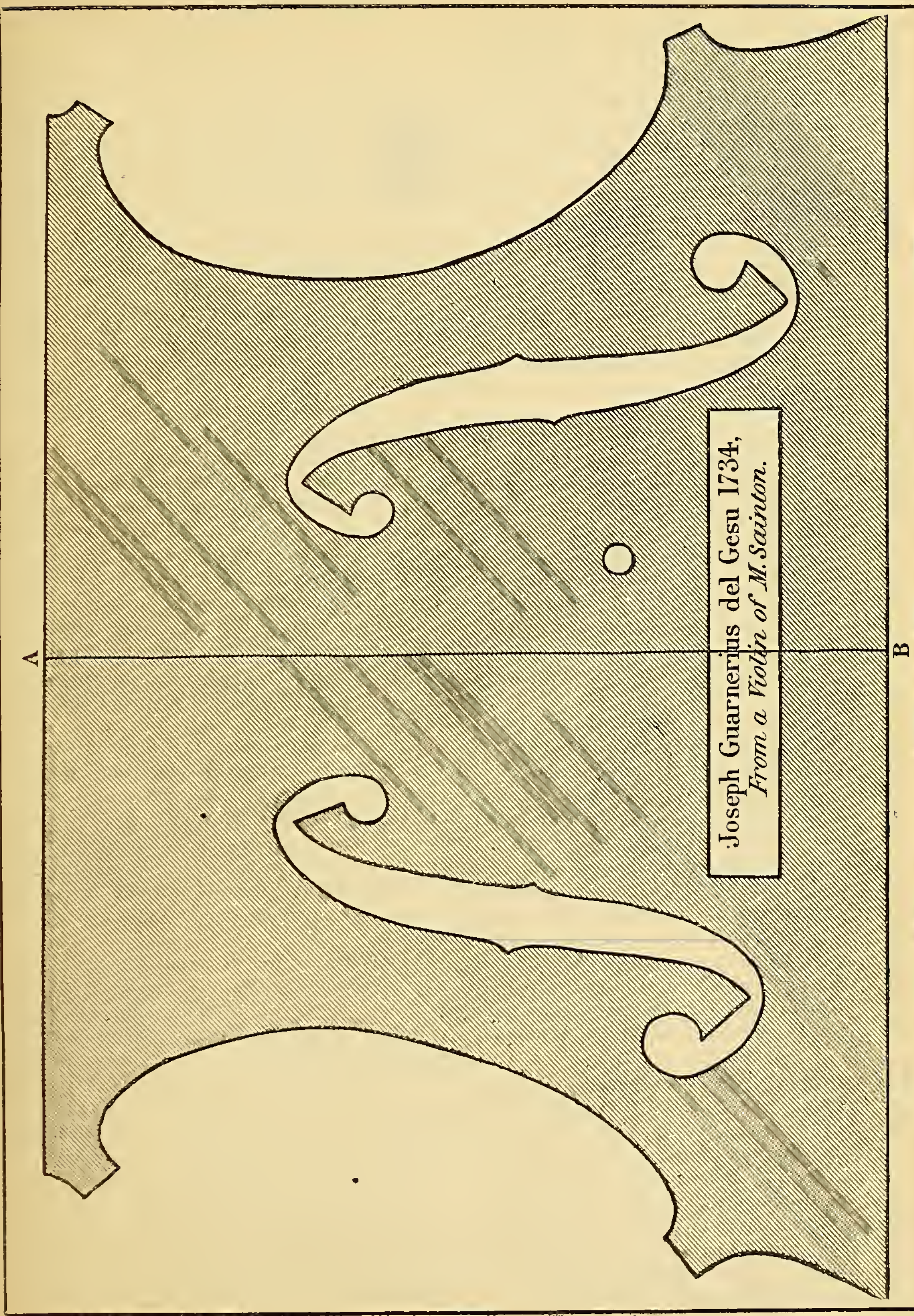


FIG. 9.—FACSIMILE OF FORM AND RELATIVE POSITION OF *f* HOLES IN M. SAINTON'S VIOLIN BY JOSEPH GUARNERIUS.

only that at the corner-blocks having only half a block to cut into you must be very cautious, and guide the knife very carefully, to avoid splitting them right down in making the grooves in the corner-blocks to receive the ends of the linings of the C's or inner bouts. When these are set, the corner-blocks may be cut to shape like the others, and the linings all round bevelled off, and planed and filed down level with the tops of the ribs; the insides of the ribs are then thoroughly cleaned with water and sand-paper, all which operations have been described before fully, and do not require repetition. The belly duly finished, as described in pp. 467-9, Vol. II., is then set on the ribs in the manner there described (p. 469), and the body of the fiddle is then completed with the purfling, as described in p. 501, Vol. II., so that you have now only to carve the scroll, fit it on a neck, and place it on the fiddle in the manner set down below.

Neck and Scroll.—As the head will first be finished and then spliced on to the neck, we are at present concerned only with the head or scroll, the outline model of which (which should be traced off, pasted on a leaf of wood, and cut out) will be found in the *Folding Sheet.* Having selected a block of maple to match your sides and back of the proper length, *i.e.*, $5\frac{1}{2}$ inches, and being $2\frac{1}{2}$ inches broad, make one *side* quite plane, and then make one *edge* quite plane and quite square to the planed side. Then mark with a gauge on this edge a line $1\frac{1}{16}$ inch from the true edge, and plane down all wood on the other side in excess of this line, so that you have a squared block $5\frac{1}{2}$ inches long by $2\frac{1}{2}$ inches broad by $1\frac{1}{16}$ inch thick. Mark by the nick A on the two sides of this block the outline of the head in the manner described in p. 562, Vol. II., except that there we had a neck to mark as well, whereas here it is cut off just beneath the chin of the scroll. Let this be cut out, keeping very true to the lines on *both* sides as before (p. 562). This done, the scroll is carved exactly as has been already set forth; but when carved it must be fitted upon a neck, as has already been carefully described in p. 258, Vol. III. This done, the fiddle is fitted with a false finger-board (as in p. 567, Vol. II.), and varnished (*vide* p. 106, Vol. III.) and fitted up as has before been set down in Chap. VIII., p. 107, Vol. III.

This, therefore, completes our second fiddle, with its variations from No. 1; and with this chapter I take final farewell of the amateur fiddle-makers who have followed me through the multifold and fascinating operations of the fiddle-maker's art. It has been a pleasure to me to describe them in all their varied forms, from commencement to finish; and to judge from the communications I have received on this subject, it has afforded pleasure as great, if not greater, to those who have studied them and acted on them.

A CORNER ESCRITOIRE OR BUREAU.

By J. W. GLEESON-WHITE.

(*For Illustrations, see Folding Sheet issued with this Part.*)

THE corners of a room have always been favourite places with the wood carver, as the old oak cupboards of the past, the corner whatnots of the present, and the many brackets, clocks and other specially-planned items show, but so far as I am aware the corner escritoire has been seldom, if ever, made, and the reason for this seems evident, as in the days of small windows, or at least of small panes, but few corners were sufficiently lighted to accommodate a writing-table; but now that in so many rooms there is often a corner close to a window, with ample light, this, the only reason that suggests itself at first sight, will be no longer a prohibition.

History while establishing many facts concerning the corner, while fully detailing its use as a place to devour special dainties, vide Jack Horner, as a place of correction—see Mrs. Barbauld and her contemporaries—as a store place for rubbish as the proverbial "odd corner" suggests, does not, I believe, tell us that any special writings have owed their origin in a corner, but rather infers it to be a plotting place and resort of the evil disposed, whose plans and writings would not bear the full daylight, which brings us back to the first reason—the want of light, now, as I said before, no longer existing.

It will be also evident that a triangular space would have to be of large size for a writing-table to be of use, or the adjoining walls would cramp one considerably, and leave neither leg nor elbow-room; but this would have a somewhat unsightly effect, and also give a great width without proportionate advantage, but in utilising the form of the old bureau, the escritoire to be described would not take up very much room.

The old bureau was so solid, with its chest of drawers underneath, that the danger of its being overset was hardly worth taking into account, but this writing cabinet would probably be unsafe without some additional support, hence the side-pieces which project, and look possibly somewhat unsightly in the sketch, but as when in place close to each wall, they would project but the thickness of the wood, I do not think the inconvenience would outweigh the safety and benefit derived from them.

If it is desired to use this, not triangular in plan for a corner, but an ordinary rectangular shape, very little adaptation would be required to suit the fresh form, but the lower part must be of sufficient solidity to act as counterweight to any reasonable pressure on the

flap when opened; as if necessary to fix it to the wall or floor, it would be evidently a badly designed piece of furniture. If used as a square bureau, the ends should be panelled in harmony with the front, and the lower portion enclosed with cupboards, to make it look equal in weight to the upper half.

The main feature of the design is the two brackets, which, when closed, give a pleasant appearance of support to the desk part, and when open keep the lid firm and true.

The working out of the whole is clearly shown in the drawings given. The brackets hinge flush to the level of the whole of the front, the shelves are grooved into the centre uprights. The side-pieces are framed as in ordinary cabinet work The diagonal strut being made in the framework, and filled up with triangular panels.

The lid of the front is panelled to be flush on the inside to afford a smooth surface for writing, this should be leather covered. The interior fittings may be varied at discretion. In describing this work, I have felt it unnecessary to go into every detail, as only a fairly good workman could hope to succeed with it, and to such a one all the detailed construction would be superfluous if not impertinent. But so far as I can see there is no obstacle to the successful working out of the escritoire from the sheet of drawings supplied. Should any question arise in my power to answer, the correspondence columns are always open to inquirers, and the information sought will, at any time, be gladly given on my part.

The decorative part of the design is given with alternative treatment—first in oak, carved in the panels and other portions with simple low relief work, so easily executed that it is hardly worthy to rank with actual carving, but still has a pleasant decorative effect; the other design is in the no-style of the furniture shops, and would require some turned work to carry it out; but I think the first design might also be worked in mahogany with lincrusta ornaments, the lincrusta left its natural dark brown, or gilded in solid dull gold, which sounds much more gorgeous and gaudy than it really is. Personally I should like the effect of lincrusta used with ebonised, or even painted, woodwork throughout; if so used, cream colour (the shade ecru of the drapers) with gold panels, or peacock blue with pale blue details picked out in the lincrusta or stained deal, the lincrusta left brown or painted a more wood-like brown (but not mottled or grained to imitate wood), or pure vermilion, the whole looking then like the coral lac work of the Chinese, that is so exceedingly good. There is, or was, a material called Stannate metal (of which I am unable to give prices or size, though I know it was in the market), that would enrich the panels with good effect; but the adaptations are impossible to enumerate, and would suggest themselves to any "canny" worker.

I may say also that in lieu of lincrusta a stencilled decoration would be good. It may not be generally known that actual Japanese stencils are imported and sold very cheaply; they are in a thin brown paper, very stiff and flat, and of excellent design, panels larger than this page, costing about two shillings to half-a-crown the dozen These stencilled patterns of flowers, Japanese figures and birds, if worked in gold size, and bronze powder dusted on, would enrich many a plain panel at small cost, and be infinitely better than the average run of "hand-painting" or the stencils supplied by the English makers.

If in some art industrial exhibition or similar place, I am fortunate enough to see such a piece of furniture carried into effect, though every detail be altered, and the source of the idea ignored, I should yet feel repaid for my effort to suggest a slightly novel shape and treatment of a very useful and too much neglected piece of furniture, whether it be called bureau, escritoire, or writing cabinet, it matters little, so long as it is firm, useful, and in its way beautiful.

HOW TO MAKE A FLY-WHEEL.

By OLLA PODRIDA.

THE fly-wheel forms an essential part of most self-contained machines, driven by manual power, such as foot lathes, bench drills, fret-sawing machines, etc., where a reservoir for storage of power is necessary to regular and continuous movement.

To obtain a fly-wheel for a specified purpose, or particular size and class of home-made machine, is, in the majority of cases, difficult, and usually attended by more expense than is agreeable. Many have, no doubt, been deterred from entering into the construction at home of useful mechanical appliances, by the question arising as to how and where a fly-wheel is to be procured.

A shift may be made by building one of wood, and weighting it with lead—a method obviously clumsy and unsatisfactory, especially for small wheels.

The writer once found himself in a "fix" of this sort, and having been there has a lively appreciation of the situation. The object of this paper is to describe as clearly as possible the means whereby anyone encountering such an obstacle may be enabled to overcome it in a comparatively cheap and simple manner.

Let us to business, taking in illustration a wheel

16 inches in diameter, with six arms, a brass "boss" or centre, and a lead rim $1\frac{1}{2}$ inches deep by 1 inch wide. Fig. 1 is a profile, and Fig. 2 a section of this wheel. Arranged round the centre boss are six smaller bosses, as at B, B, for the reception of arms. In the illustration, the centre of this wheel is given at 2 inches long and 2 inches diameter, with an eye 1 inch in diameter. The bosses for arms are each $\frac{3}{4}$ of an inch in diameter and $\frac{3}{4}$ of an inch long. The arms are of $\frac{5}{8}$ inch round iron screwed tightly into the bosses to a depth of $\frac{3}{4}$ of an inch. The arms and centre are fitted together first, and the rim cast on them afterwards, as will be shown. We will take the making of the requisite parts and patterns, and describe the process in detail. I will take the opportunity to say here that all the figures are on a scale of one-sixth the size, or 2 in. to 1 ft., except Figs. 5 and 8, which are on a scale of one-third size, or 4 in. to 1 foot.

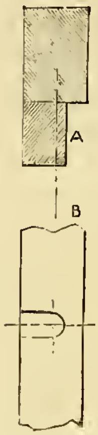


FIG. 5.—(A) SECTION THROUGH RIM AND ONE OF PRINTS. (B) PLAN OF DITTO.

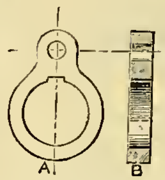


FIG. 9.—CRANK IN PROFILE (A) AND SECTION (B).

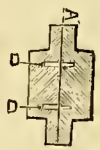


FIG. 3.—PATTERN FOR CENTRE.

FIG. 8.—MENDER IN SECTION (A) AND IN PROFILE (B).

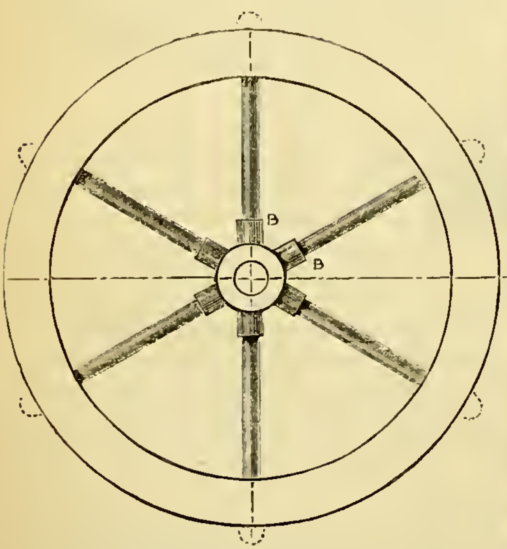


FIG. 1.—PROFILE OF WHEEL.

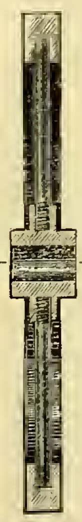


FIG. 2.—SECTION OF WHEEL.

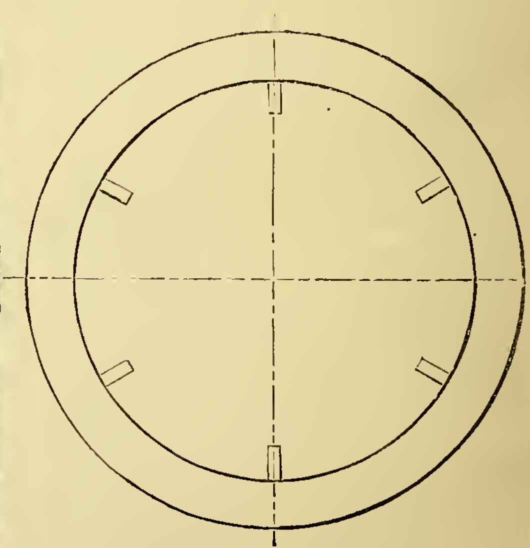


FIG. 4.—PROFILE OF PATTERN OF WHEEL.

Pattern for Centre.—This should be made of mahogany, and must be in halves through centre of small bosses at A B, Fig. 3. The blank for centre should be fitted together with dowels, as shown at D, D, and marked so that the relation of the dowels and holes is maintained. The dowels are for the purpose of preventing any possibility of "shift" while moulding. Dowels fitted, the centre may be turned up in the lathe; the pressure of the centres will keep the parts together if well-fitted in the first place. For moulding, these dowels should be made an easy fit, and greased to prevent them from sticking. The small bosses may be turned in one length, and cut off as required, allowance being made for fitting to cylindrical surface of centre boss. The stuff from which the centre bosses are turned should be in halves, tightly glued together with paper between the joints, so that after they are fitted they may easily be separated.

The mould will be in two parts with parting line at A B. The casting will be of brass, and may be cast in plaster of Paris (see articles on "Brass Casting at Home").

Drilling and Tapping Small Bosses for Arms.—Centre the boss, forming eye of wheel at both ends, and place it in the lathe. See that it runs true. Turn it round, marking a line through the centre of each boss. These lines will form a guide to keep the arms true. Mark cross lines on and in the centre of each boss, and centre punch for drilling. In drilling use a drill chuck in the lathe, placing the opposite boss against the "poppit" centre. For a $\frac{3}{8}$ inch "tapping" hole, the drill will require to be a shade under $\frac{5}{16}$ of an inch in diameter, and should be sent in to a depth of 1 inch, to save trouble in tapping. Be careful in

tapping. Keep the tap diametrically true with the opposite boss.

Arms.—These are $\frac{3}{8}$ inch round iron, screwed up $\frac{3}{4}$ of an inch from one end to a tight fit in bosses. They are $6\frac{1}{4}$ inches in length, but it will be advisable to allow them $\frac{1}{8}$ of an inch longer, so that they may be cut to a uniform length after being screwed in place.

Pattern for Rim.—Fig. 4 gives a profile of this. It may be turned or cut from a solid piece of wood, but it will be better to build it of segments, so that the grain of the timber may be arranged to prevent shrinkage and warping in the pattern which would occur if made solid. Yellow pine may be used in the construction. The prints are arranged to suit the number of arms. Fig. 5, A, gives a section through the rim and one of the prints, and B a plan of the same. Both of these figures are drawn one-third size. The prints are as seen in B, of U form, carried up from the centre to one side of rim, so that they may "draw" out of the sand. A little "draught" or taper must be given on all "vertical" parts of the pattern. By "vertical" is meant those which leave the sand in a perpendicular direction.

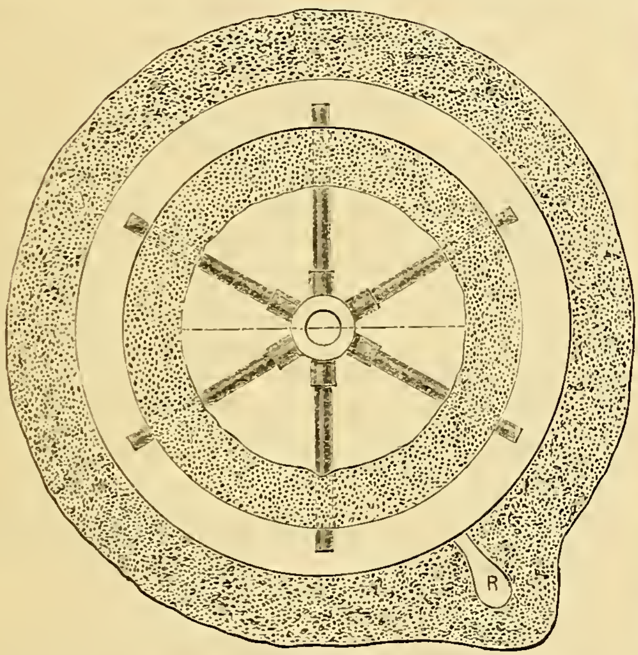


FIG. 6.—PLAN OF MOULD, COMPLETE.

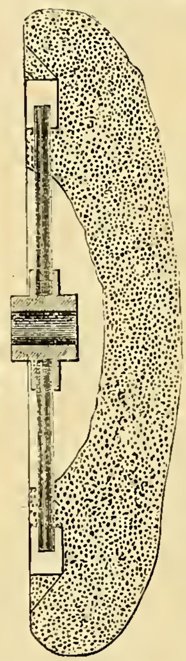


FIG. 7.—SECTION OF MOULD.

Preparing the Mould for Rim.—Get some moulder's sand. It can be obtained at any foundry. Failing that, get some fine garden mould, or earth from an old hedge, dry it and sift through a fine sieve to obtain an even texture. If mould cannot be obtained, coke ashes will do, but it must be carefully treated, and not made very damp, being very fine it is liable to stick in pasty lumps if made wet.

A shallow box or tray will be required about 3 inches deep, and a couple of inches larger than the wheel to be cast. In this the mould will be made by filling up with sand, and pressing the rim pattern firmly into it, ramming the sand around it inside and out, filling up as required until it is firm and solid. Then level off the sand fair with the upper surface of pattern. Now loosen the pattern, preparatory to its removal, by sticking a sharp-pointed nail into the wood, and lightly tapping it sideways until the pattern appears quite free to come up. Stick two nails into it on opposite sides, and by them lift the pattern very quietly and steadily, tapping the nails lightly, until clear of the sand. An extra "hand" will be required on this job; the "missis," or anyone else handy, may be pressed into the service.

Furrows, to clear the arms, will have to be cut towards the centre from the print marks. The sand in centre may also be cleared away as shown in Fig. 7, which is a section of the mould when ready. Cut a small opening or "gate" into the mould from outside for pouring the metal. This opening may extend to the bottom, and must be enlarged at the outer end to form a reservoir for conveniently pouring into, as shown at R, Fig. 6, which exhibits a plan of mould complete.

Holes should be pierced through the sand from upper surface to angles in inside and outside of bottom of mould, at intervals of an inch or so right round. These are to allow escape for the steam generated in casting, and can be made with a darning needle, the sand being lightly supported by the fingers during the operation.

Now place the centre of wheel in position lightly and carefully. Gauge it by means of a pair of compasses to a central position with the mould. This satisfied, fill up the spaces above arms in print marks level with the surrounding sand. To prevent the sand from falling into the mould, a "mender," shown in section at A, in Fig. 8, and in profile at B, is used. It

is a piece of wood cut to the same radius and section as the rim, with a slot at S to clear and fit over the end of the arm in mould.

The centre of wheel should be weighted to prevent it from shifting or rising when the metal is run in. Be careful not to weight heavily for fear of crushing the mould. One or two pounds will be sufficient for the present example.

If the casting is to be an "open" one, *i.e.*, without an upper box or cover, then we are ready for pouring if the mould is level. This levelling must be carefully attended to, else gravitation will assert her power, and the result will be a "thick" and "thin" rim. In pouring, skim all dross from the surface of metal, and pour swiftly but not "splashfully." Immediately after the mould is filled, and while the metal is liquid, dust sand lightly and evenly over the surface. This will give a "face" to the casting, and promote even contraction.

If a closed mould is preferred, a cover may be made by cutting out a ring of wood, a couple of inches larger than the rim or mould. This ring may be $\frac{5}{8}$ inch or $\frac{3}{4}$ of an inch thick, according to size, and should be stiffened on one side by ledges nailed across. Fill up the other side with small brads, allowing them to project about of an inch, and about $\frac{1}{4}$ of an inch apart. "Rough cast" the face of ring and brads with sand and water, so that a "foot hold," as it were, may be provided for the sand in filling up to a face about $\frac{1}{4}$ of an inch above the brads. Level off firmly, and the cover is ready. It must be securely weighted in position. The "runner" or "gate" should, in this case, be banked up with sand around the opening, level with top of cover, and a "riser" or outflow made on the opposite side, in a similar manner and equal in height.

Boring Eye of Wheel.—This, if practicable, should be done after the rim is cast. If not, it will have to be set very exactly in centre of mould, and even then will be subject to alteration through contraction of the rim.

Crank.—If one is required, it may be keyed on the boss, and of the form given in Fig. 9, in profile at A, and in section at B. It may be made of wrought iron, and if necessary, the centre of wheel may be made longer on one side to give better accommodation for it.

General Remarks.—Wheels made on this principle are very efficient, being light in the neighbourhood of the centre, and heavy in the rim, thus giving greater effect with less weight on the whole. If within the amateur's resources, it may be turned on the rim, and grooved or speeded as desired. If not, an outer rim of wood may be attached, and the grooves or speeds cut in that. To facilitate the fixing of wood, "lugs" should be cast on the rim to accommodate wood screws. These lugs are shown in dotted lines in Figs. 1 and 2. To give a smarter appearance the arms may be of brass rod or tubing.

Some practical minds may object to fixing the arms in centre before casting on the rim. The writer is aware of the precautions necessary in large castings of this description, but for small ones with lead rims the necessity for casting the *centre* last is unnecessary, and he has therefore described the simplest way of accomplishing the job. Of course, the rim will shrink proportionately in any case, but this can easily be remedied if necessary by stretching it by a few blows with a hammer.

Lastly, be very certain when about to cast, that you have sufficient metal. To find, when all the metal is run, the mould only partially full, is by no means conducive to equanimity of mind, and cutting or melting off a "waster" rim, in addition to a spoilt mould, is decidedly subversive of good temper.

To ascertain the weight of metal required, calculate the number of cubic inches in the rim, and multiply by ·41—a cubic inch of lead weighing that fraction of a pound. The content in cubic inches may be found by subtracting the area of a circle whose diameter equals that of the inside of rim, from that of a circle equal to outside of rim, and multiplying by the thickness or breadth of rim. These dimensions to be taken in inches, so that the result may be in cubic inches. A few pounds over should be allowed for "runners," "risers," and waste.

HANDY WOOD-WORKING TOOLS, AND HOW TO MAKE THEM.

By A. J. SCOTT.

III.—ECCENTRIC GAUGE—WEDGE GAUGE—PANEL GAUGE—LUBRICATOR BOX—BEVEL.

IN this article I intend to show my readers how to make a few more useful tools, some of them I might go so far as to say indispensable ones. They include three different kinds of gauges, one handy lubricator box, and a very handy bevel which will perform offices which the ordinary shop one would not be able for to do. In Fig. 16 we have an elevation of what I will venture to call an eccentric gauge, the working of which will be easily seen from the sketches given. In this G indicates the pin for marking; I, the rod or staff; K, the stock; L, a small piece of hardwood countersunk in for finger screw at C to work up against and tighten the staff or stock. Fig. 18 shows a section of the thumb end of screw through C D, in Fig. 19, which shows a section of stock at A B, in

Fig. 16, through the centre, showing staff, I, finger screw, M, and the small piece of hard wood, L. I should most certainly make this gauge of beech or rosewood. The staff should be about 9 in. long. I have no given dimensions of any of the parts, as the drawings are all half-size, and the dimensions can be easily got from them, but they have no need to be strictly adhered to as the amateur can alter them to suit his own special case, but the sizes I have given have been found out by experience to be the handiest sizes. The reader will notice at P, Fig. 17, a dotted line running inside of the dotted one of the screw, this will require cutting out the width of L, as shown in Fig. 19, and at C, in Fig. 16. For the sake of clearness this part of Fig. 16 has been repeated full size in Fig. 17. The reader will also notice that another catch-piece may be substituted in the place of L, just as the amateur may fancy, as fitting the catch-piece L requires more skill in working the recess than if it run straight through, as in the case of M, but to prevent the piece from dropping out, it is better to cut two joggles on it as shown top and bottom. In making the gauge, the best plan to pursue is to make the stock, first cutting the hole for staff, and boring the one for screw with an ordinary centre-bit Then making the staff as good a fit as possible without any shake in it afterwards ; make the catch-piece L and the finger screw drop in their places, and the gauge is finished. The pin G, I have supposed to be fastened in when the staff was fitted, all that now remains to be done to it is to well oil it or varnish it.

In Fig. 20 we have an elevation of another kind of gauge, generally called a wedge gauge, the difference being that the staff is rather stronger than that of the last, and semicircular at one side, as you will see from the section in Fig. 21. You will notice at K, Fig. 20, the top part of stock follows a sweep which will enable it to go round inside curved surfaces, and the flat side for ordinary work, J representing the wedge. In Fig. 21 we have a general view of the wedge, showing the size and shape of mortise to be made in stock. One thing, however, I must first caution in the making of this gauge, which is not to make the stock end way of grain running from top to bottom of gauge, it would be better for the first one, as I have described, as there is no opening strain on the fibres, nothing like as in this case ; and in making it endway the stock will not wear as soon as if it was made lengthway of the grain, so you will see there is an advantage in one case but not in the other ; therefore, make the wedge gauge lengthway of the grain. I once made one endway, and the very first time of using it, the two parts from R and S came asunder, and learnt me a practical lesson on it; but, however, I don't wish any of you to make this mistake. Take the old adage "Correct your faults by other people's," and you will find the benefit in making anything you may require. I don't know which is the handiest of the two gauges I have described, and which can be the quickest set ; but I may say they are the handiest gauges I have ever seen or worked.

In Figs. 22, 23, and 24 we have what I term a panel gauge, which the amateur will find very useful in planing broad boards to their width, as in some kinds of furniture, etc. He will not find it a very difficult one to make, but on this gauge he may spend a little more labour than on the last, and make it a splendid tool, such as he would not object to anybody picking it up from his bench and examining it. In Fig. 22 I give a view of one end of the staff or rod. This I should make at least 16 inches or 18 inches long, but if any longer, make the staff a little stronger than I have shown, or else it will not work so nicely as it otherwise would do. In Fig. 22 H is a separate piece of hard wood, such as ebony or box, glued with a dovetail end on to the piece I, the face from this piece to the face of staff to be the same as the working face of the rabbet, Fig. 24, from the staff. In Fig. 23 is a plan of this gauge : K, the stock, I, the staff, J, the wedge, which may be an ordinary shaped one, and N, the rabbet. The depth of this can be seen from the sketch in Fig. 24, where the letters represent the same parts as in the previous figure. The space M is a thumb-space to push the gauge along, the size of which must be regulated by the size of the amateur's thumb. The edge looks well rounded, as shown in Fig. 24, but if the stock was made a little larger, the edge might be made semicircular, which would be better still. Do not put the pin G, in Fig. 22, any nearer to the end than shown, as thereby you would run a chance of splitting the hard wood, H, and the staff also. Perhaps the best wood for this is rosewood ; and if made out of this wood, I would make the staff out of one piece, not jointing it as shown ; and if nicely polished it will be, as I have said, a tool the amateur will be proud of, and ready to allow anybody to look at it and criticise it.

In Figs. 25 and 26 we have a useful adjunct to the bench. It is a fat-box, or lubricator for screws, etc. Any fancy hard wood will do for this. The two sketches will nearly explain themselves; Fig. 25 is the plan of lubricator ; Fig. 26 is a section through A B of Fig. 25. First, you will require a block the size of body : having first planed the two faces, set out each side true with the other, working from the centres you put on next. Turn out in the lathe if you have no centre-bit, the hole for the tallow, and work it out to shape afterwards. Next make the lid, and fasten with a brass round-headed screw, as shown in sketches. Sandpaper all up and polish.

In Figs. 27 and 28 we have, perhaps, as handy a tool as any shown. It is a large bevel, but can be

increased or decreased in size as the amateur wishes. If he has some old oak by him, that is the stuff to make it out of. Failing that, use rosewood or ebony, if not too expensive. Fig. 27 shows the plan of bevel, of wood accordingly. The four screws, as shown, should have good threads, and be countersunk level with the face of bevel as shown. A much neater way than above, and equally as strong in my estimation, is

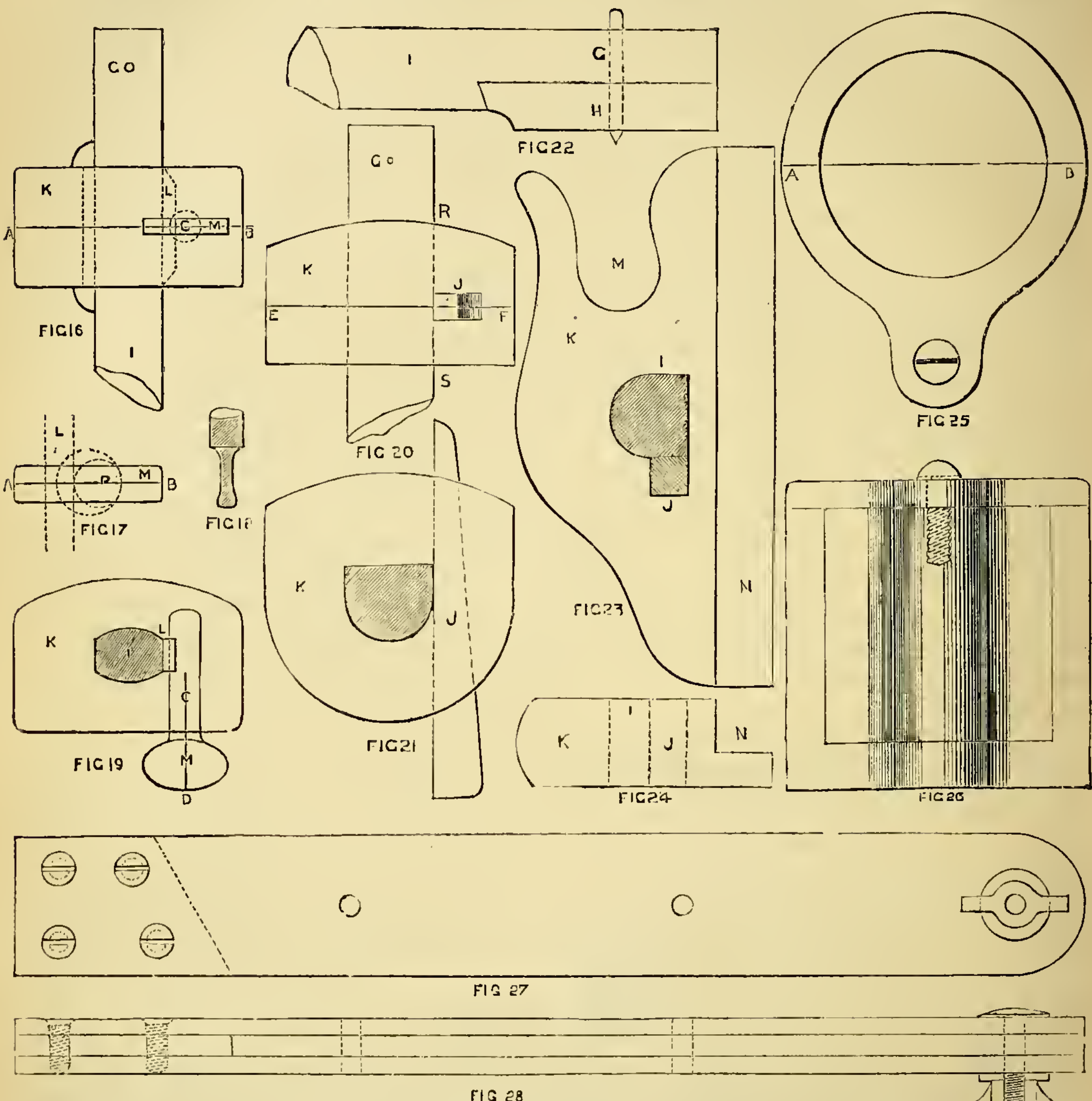


FIG. 16.—ECCENTRIC GAUGE, ELEVATION. FIG. 17.—PART ABOUT C, FIG. 16 (FULL SIZE). FIG. 18.—SECTION THROUGH C D IN FIG. 19. FIG. 19.—SECTION THROUGH A B IN FIG. 16. FIG. 20.—WEDGE GAUGE, ELEVATION. FIG. 21.—SECTION THROUGH E F, FIG. 20. FIG. 22.—PANEL GAUGE, SIDE ELEVATION OF TOP END OF ROD. FIG. 23.—PLAN OF STOCK. FIG. 24.—END ELEVATION OF STOCK. FIG. 25.—LUBRICATOR BOX, PLAN. FIG. 26.—SECTION THROUGH A B, FIG. 25. FIG. 27.—BEVEL, PLAN. FIG. 28.—ELEVATION.

and Fig. 28 the elevation. As you will see, one end is fastened together with four screws; and the two small holes you notice in the centre are to shift the blade as required. The screw at the other end you may get of any ironmonger, together with the washer and wing-nut. If made any larger than shown, increase the strength to put a number of dowels in place of the screws, about the same number as shown in screws would do: by doing so you will get a much neater job. In my next I will describe some handy trammels, and a few other oddments which the amateur will find very handy.

(*To be continued.*)

HINTS FOR THE CONSTRUCTION OF CHEAP CHEMICAL APPARATUS.

By W. H. E.

(*Continued from Vol. II., page* 534.)

II.—Chemical Blowpipe—Wash Bottles—Balance and Weights—Sulphuretted Hydrogen Apparatus—Funnel Holder—Specific Gravity Flask—Syphons—Test Papers.

CHEMICAL BLOWPIPE.—The body of the blowpipe is a tapering tube, as shown in Fig. 6, made of tin-plate. The following dimensions will give a very good shape, viz., length, 8 inches ; diameter at mouthpiece, $\frac{3}{8}$ inch ; at wide end, $\frac{7}{8}$ inch. The bottom of this tube, *i.e.*, the wide end, is closed with a circular piece of tin-plate ; care must be taken in soldering this that no hole is left, so that air may not escape when the blowpipe is in use.

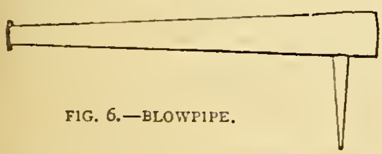


FIG. 6.—BLOWPIPE.

A piece of iron wire soldered round the top will give the mouthpiece a finished look. About $\frac{5}{8}$ inch from the closed end of the body-tube a hole must be made for the lateral tube which is then soldered into it. The lateral tube is also tapering and made of tin-plate ; dimensions : length, 2 inches ; diameter at wide end $\frac{1}{8}$ inch, tapering to a point just sufficient to admit a fine needle. The whole must then be japanned. If the soldering, etc., of the body-tube is thought troublesome, a brass tube of the same length may be substituted.

Wash Bottles.—These may be made from ordinary pickle bottles, or any others with sufficiently wide mouths. Bend, by heating in the spirit-lamp, two pieces of soft quill tubing at right angles (one piece shorter than the other), making one of the legs longer than the other. Then with the cork-borer make two holes in the cork of the bottle and fit the tubes tightly into it, allowing one of them to reach within $\frac{1}{4}$ inch of the bottom of the bottle when corked, and the other to pass only through the cork, as shown in Fig 7. The wash bottles are connected with the delivery tube of the generator, or with each other, by small pieces of indiarubber tubing. All the fittings must be tight to prevent the escape of the gas when in use. A number of wash-bottles will be required, as sometimes two or more are necessary for a single experiment.

FIG. 7.—WASH-BOTTLE.

Aspirator.—As this is a costly piece of apparatus, the amateur chemist can fit it up far more cheaply at home than he can buy it. It is shown in Fig. 8. To make it, procure a large oil-can, and if there are any old gas-fittings lying about, the elbow joint containing the tap for turning the gas on and off, will make a very good tap for the aspirator. Do not *screw* the joint off, but cut off about an inch of the pipe along with it. If a gas tap is not to hand, the tap of a water barrel will do equally well. In case neither is to be had, a brass or tin-plate tube must be substituted. Make a hole near the bottom of the oil-can, and solder the tap or tube into it. If a tube is used it may be stopped by a cork or wooden plug, and the flow of water regulated by having corks with different sized holes bored through them. A cork in which a glass or other tube has been inserted is placed in the neck of the can which, after being filled with water, is ready for use.

FIG. 8.—ASPIRATOR.

Balance and Weights.—Procure a piece of flat steel about $\frac{3}{8}$ inch broad, such as is used by dressmakers, etc. ; make it 6 or 7 inches long. Drill holes about $\frac{1}{4}$ inch from each end, and also one exactly in the centre. Take a piece of strong steel wire, redden and shape it according to form and dimensions of B in Fig. 9. The ends are to be filed on the lower side to a knife-edge, as at C, and re-tempered ; pass it through the centre hole of the beam, and fasten with a drop of solder. Cut another piece of the same flat steel 5 inches long. At a length of $\frac{3}{8}$ inch from each end drill holes sufficiently large to give the knife-edge of the beam free play. Drill another hole exactly in the centre ; heat the steel, and bend to the shape shown at D, having the sides $\frac{1}{2}$ inch apart, and re-temper the steel. Make a small ring and fit it into the hole in the top. Fix the beam in the beam-suspender, and fit it up with cords and scale-pans. The scale-pans may be made of tin-plate, hollowed out with a round-faced hammer. If glass scale-pans are preferred, then shape two pieces of wire according to form shown at E, and place two watch-glasses on the ring at the end of the wire. Of course glass scale-pans drilled for cords may be bought at two shillings per pair, but the object

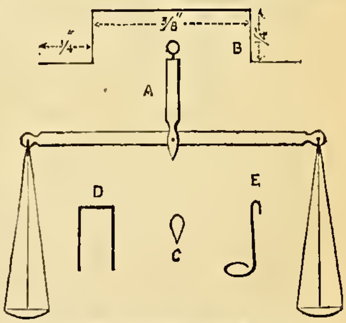


FIG. 9.—BALANCE.

A, Balance, complete. B, Knife Edge, enlarged. C, Cross Section of Steel Wire forming Knife Edge. D, Beam Suspender. E, Wire Support for Glass Scale-Pans.

of these papers is to show the beginner in chemistry how he may construct *cheap* apparatus. The loan of a set of weights may be obtained, and a corresponding set made of sheet lead, which can easily be cut and dressed with a knife. These must not, however, be used for trading purposes without having been stamped according to the Board of Trade regulations. I have not mentioned rings for the scale cords, ornamenting the ends of the beam and beam-suspender, etc., as these things will be seen at once on a reference to A, in which the balance is shown complete.

Sulphuretted Hydrogen Apparatus.—A *chemical* flask, *i.e.*, one that will bear the application of heat, is fitted with a cork, a hole having been bored in it, through which a long acid funnel passes, reaching to the bottom of the flask, as shown in Fig. 10. A piece of quill tubing is bent according to the shape shown in the diagram, and passed through another hole in the cork, but only for a short length, since it serves as a delivery-tube for the evolved gas, and consequently must be clear of the liquid at the bottom of the flask. As this gas is of such great importance in the laboratory for testing purposes, it may be well to state that it can be obtained absolutely pure from hydrochloric acid and antimonious sulphide. But the principal benefit of using these materials is, that since they require heat to give off the gas, the generator may be kept charged and the gas turned on and off at will, by applying or withdrawing the spirit lamp, as the gas ceases to come over the moment the source of heat is withdrawn. If it is prepared in the ordinary way, *i.e.*, by using iron sulphide, a bottle will do instead of a flask, as it will not then require to be heated.

FIG. 10.—SULPHURETTED HYDROGEN APPARATUS.

Funnel Holder.—This piece of apparatus is used in filtering operations to support the funnel and its contained filter. A piece of ordinary fencing wire, from a foot to 18 inches long, is fastened in the centre of a piece of wood, in the same manner as the wire of a letter file is fastened into its foot. The end of the wire, of course, must be sharpened either in the fire or with a file, before it is driven in. The wooden foot may be any size or shape which fancy may dictate, only that it must be sufficiently large to keep the apparatus steady when in use—I say when in use, for you must when making the foot calculate on the weight of the funnel and its contents. Bend a piece of strong wire to shape shown in diagram. The ring may be closed with a drop of solder and the end of the wire sharpened. Procure a small block of hard wood; pare it to a rectangular shape; bore a hole through the centre to admit the upright. The block must be made a tight fit, so that it will not slide, but only be capable of moving up and down by force. Bore a hole in one of the side faces and insert the sharpened end of the wire ring. If it is to be a double holder, make another ring and place it in the opposite face of the wooden block; in fact, it may be made to support four funnels at the same time, by putting wire supports in each face. If the trouble is not thought too great a clamp like the one described for the retort stand may be made instead of the sliding block, and will be found much more handy in use.

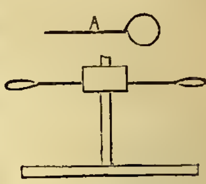


FIG. 11.—DOUBLE FUNNEL HOLDER.
A, Wire Support for Funnel, in Plan.

Specific Gravity Flask.—Procure a *very thin*, *light*, glass bottle, or flask with a wide mouth. On the lathe turn a hard wood stopper which will fit the mouth of the bottle accurately; it must also have a flange, so that it may always go down the same distance into the neck of the bottle. Take a glass tube with a very fine bore, about an inch and a half longer than the stopper, and having bored the stopper fit the tube into it, and fix with a little varnish, white lead, or other like substance; the lower end of the tube may be just on a level with the bottom of the stopper. About half an inch from the top of the tube scratch a fine mark on the tube with a file. Note, the lighter the flask, the finer the bore of the tube, the more accurate the fit of the stopper, and the more non-porous the material of the stopper, the greater will be the accuracy of the results obtained.

Syphons.—These can be made of soft quill tubing; a piece is bent in the spirit-lamp till the two legs are parallel, or nearly so, and leaving one leg longer than the other, as shown in the three forms given in Fig. 12. The greater the difference in the length of the legs, the quicker will be the flow of the liquid. Remember it is always the shorter leg that is to be immersed in the liquid to be drawn off.

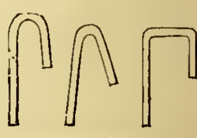


FIG. 12.—SYPHONS.

Test Papers.—Litmus papers are, as the name implies, made from litmus solution, but a perfect substitute may be made by boiling red cabbage, cut up small, in water just sufficient to cover it. Stain sheets of paper with the solution thus obtained; dry and cut into strips, 2 inches long and ⅜ inch broad. The red litmus papers are then made by immersing the blue ones in diluted sulphuric or other acid; the acid is to be diluted till it is just sufficient to redden the paper. Starch papers are used for ascertaining the presence or absence of ozone. Prepare a solution of one part of potassic iodide to two hundred parts of distilled water, thickened with ten parts of starch.

The starch must be boiled before use. This is an exceedingly delicate test. Moisten the test papers before use. Turmeric papers are made by staining paper with an infusion of turmeric in boiling water. All these test papers must be made of *soft* paper.

With this, wishing my chemical friends success in their experiments, I bring my remarks on the Construction of Cheap Chemical Apparatus to an end.

MY FURNITURE, AND HOW I MADE IT.

By MARK MALLETT.

PART I.—HOW I FURNISHED MY BEDROOM.

I.—MY DRESSING-TABLE.

IT was not that I had any particular skill in carpentry, nor that I had any elaborate kit of tools which I was desirous to use, nor yet that I was hard up for occupation, that induced me to become the maker of my own furniture. I had, it is true, some knowledge of the use of tools, and enough brains and determination to carry through any undertaking which I might take in hand. As to tools, I had a few of the most ordinary—a saw, a smoothing-plane, a hammer, a screw-driver, and a chisel or two, with some gimlets and bradawls—but bench I had none, nor any of those accessories to it, which most amateurs, not to mention professionals, deem indispensable; whilst, at least so far as regarded the day, my time had to be spent in my legitimate calling. Mine was that strong and time-honoured incentive—necessity; I was tired of life in lodgings, and I had not the means of buying furniture.

I could, of course, have hired, or bought furniture, to be paid for by instalments, but such plans did not fall in with my views. I have ever held decided opinions as to the morality of running in debt. I was, moreover, proposing to marry as soon as I could do so with prudence, and I rather wished to save every sovereign that I could for that purpose, than to entangle myself with obligations which circumstances might render me unable to meet.

Under these circumstances the idea occurred to me of making my own furniture. I knew that to go into the shop of an upholsterer with a single sovereign in one's pocket would be absurd, whereas in a timber yard that coin would buy quite a handsome stack of deal boards, which, when cut up and put together, would go a long way towards furnishing a room. So I set myself to consider how, with the tools and skill at my command, it might be possible to work up such cheap material in a manner that would be presentable.

My daily occupation was of an artistic kind, so that I knew how to set about designing what I wanted. With such appliances as mine, any attempt to imitate the ordinary furniture of the shops would be futile; so I resolved not to try it. Simplicity and strength were to be the leading characteristics of my work, and I determined that whatever I did in the way of ornament should be a result of construction, rather than a thing to precede or clash with it. The following general rules I laid down for my guidance: 1. Never to be ashamed of my materials, nor of the manner in which they were put together. 2. Seeing that it was not in my power to conceal my joints, never to attempt to do so, but rather, if possible, to emphasize and make a decorative feature of them. 3. To avoid, where possible, all glue, nails, and putty, and boldly and openly to fix my work together with screws, using round-headed ones wherever possible, and making them also a decorative feature.

I took a small empty house, and set about my task. Evening was my time for work, and I often got so much interested in it as to carry on my labours into the small hours. I opened trade relations with a neighbouring timber yard, and thence got my material—pine boards. As I had no bench-planes, I had my boards planed at the yard at an extra cost of about 4d. per side. All other work I did myself, and with what result the reader will see in the following papers.

My dressing-table, of which a perspective view is given at Fig. 1, is 4 feet long and 2 feet broad. Its total height is 4 feet 6 inches, and its height to table-top 2 feet 4 inches. The perspective view is not drawn to scale, but the working diagrams, except where otherwise expressed, are on a scale of 1 inch to the foot.

To construct this table the reader will observe that we shall, in the first place, require $\frac{3}{4}$ inch stuff to form the two ends. Pine is the wood generally recommended for use in making this furniture. Fig. 2 gives a view of the inner side of one of these ends. It is, as will be seen, composed of three lengths of board, 2 feet $3\frac{1}{2}$ inches long, and 8 inches wide, held together by five ledgers. The four lower of these ledgers will also serve for the drawers to run upon. They are of $\frac{3}{4}$ inch stuff. The three middle ones are 1 inch, and the upper and lower ones each $4\frac{1}{2}$ inches wide. These ledgers are to be screwed in their places as shown, with flat-headed screws. It will be observed that towards the back (marked B) the ledgers do not extend to the outside by $\frac{1}{2}$ an inch. This space is left to receive the boarding of the back of the table. Also, that to the front (marked A), except at top and bottom, they extend only to within $\frac{3}{4}$ of an inch of the outside. This is to admit of fastening on those pieces

which come between the drawers.

The partitions for the two sides of the knee-hole will be precisely similar to the ends, excepting that these will not require the projecting ½ inch of vertical board at the back. These four supports, when thus made and screwed together, will be found to carry the table with great firmness and solidity.

For the back of the lower part of table ½ inch match-boarding will suffice. The length of each piece must be 3 feet 9½ inches, and we will suppose them to be 8 inches wide in sight. They are to be placed horizontally, as shown in the elevation, Fig. 3, and screwed to the partitions and to the ledgers of the ends. If we begin at the bottom, three widths will bring us to within 3½ inches of the top.

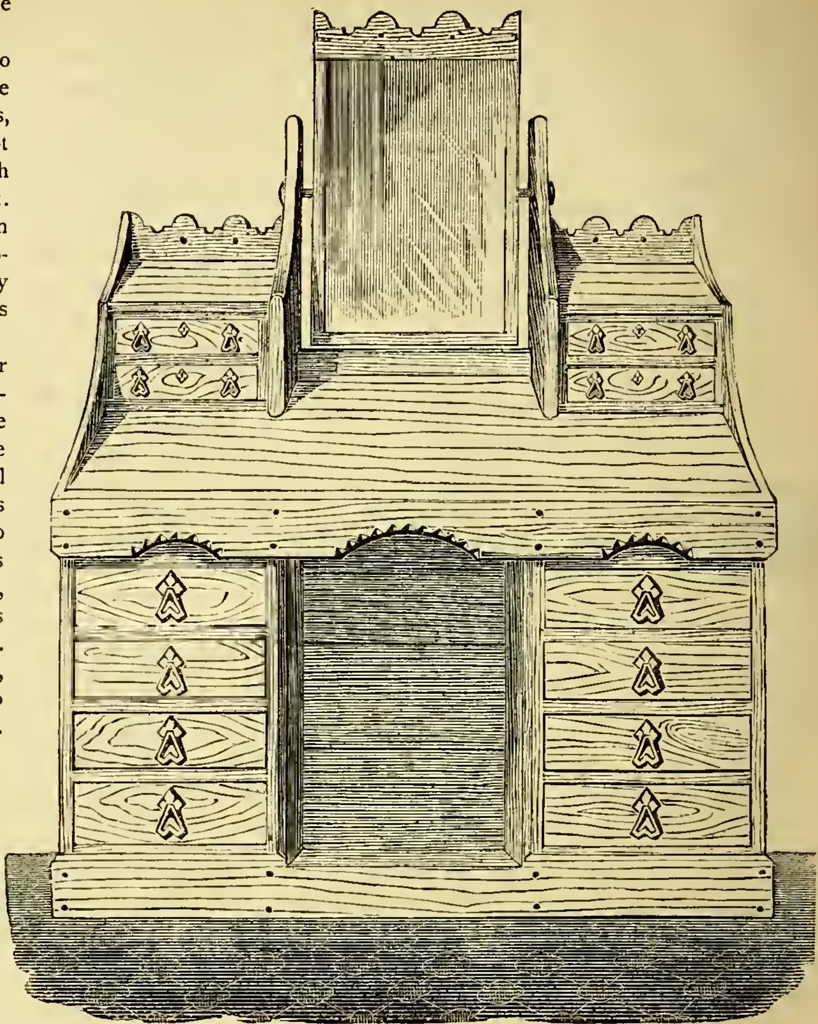


FIG. 1.—PERSPECTIVE VIEW OF DRESSING TABLE, COMPLETE.

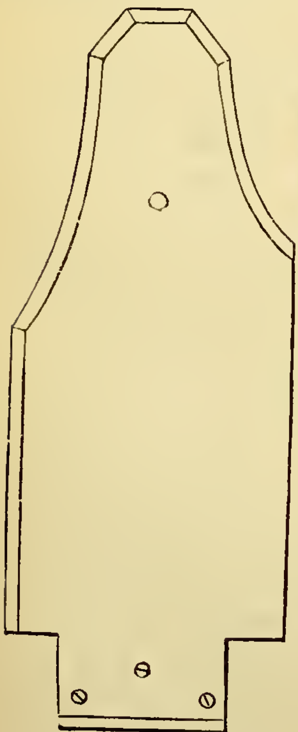


FIG. 4.—SUPPORT FOR GLASS.

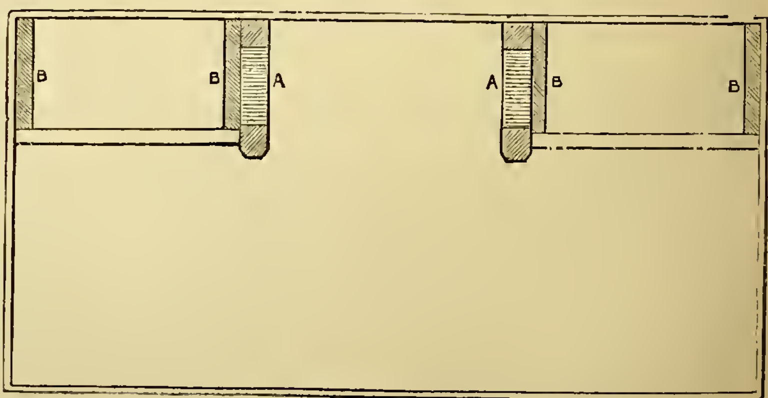


FIG. 5.—PLAN OF TOP OF DRESSING TABLE.

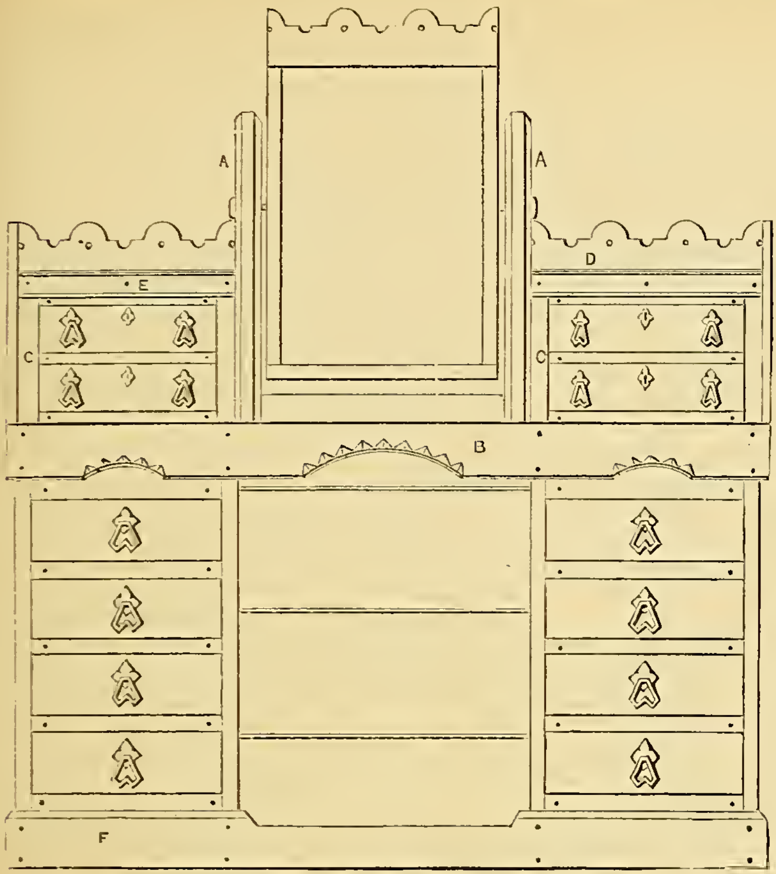


FIG. 3.—FRONT ELEVATION OF DRESSING TABLE.

This space we may, however, leave for the present.

We may next fix in the front, the strips which serve to divide the drawers. They are to be cut from $\frac{3}{4}$ inch stuff. The upper and lower are 2 inches wide, the three middle ones 1 inch wide. When in place they will come flush with the front edges of the ends and partitions. They are to be fastened with small round-headed screws, as shown in the elevation, Fig. 3. If the screws are driven somewhat obliquely, they will have a firmer grip than if they were sent exactly in the same direction as the grain of the ledger.

The main framework of the table is now put together, and we may proceed to give it its top. This is to be of $\frac{1}{2}$ inch board, which will be screwed down to the ledgers of the ends and partitions with flat-headed screws. It will come

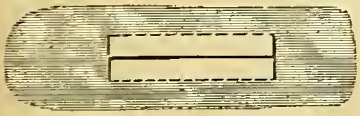


FIG. 7.—MODE OF CUTTING OILCLOTH TO ADMIT SUPPORTS.

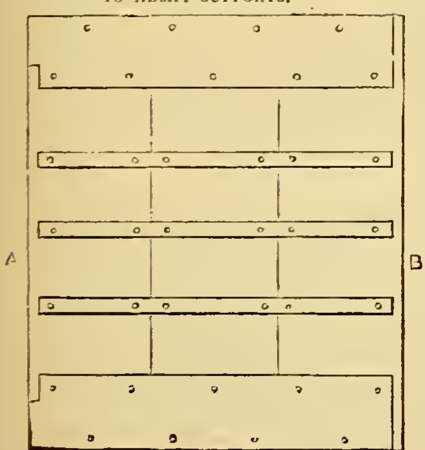


FIG. 2.—INNER SIDE OF END OF TABLE.

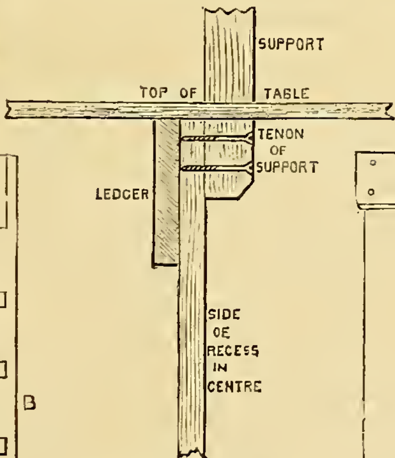


FIG. 6.—TRANSVERSE SECTION SHOWING HOW SUPPORTS OF GLASS ARE FIXED.

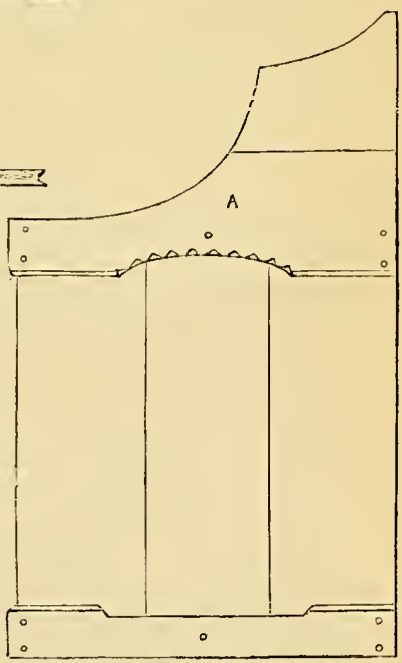


FIG. 8.—ELEVATION OF SIDE OF TABLE.

flush with the framework at the front and ends, and will not overlap them, whilst at the back it will be kept $\frac{1}{2}$ an inch in.

We may next begin to make some arrangements for the superstructure of our table—the looking-glass, namely, and jewel-drawers. The glass measures, at sight, 19 inches by 12 inches; its weight, therefore, and the fact that it will be subjected to frequent movements and adjustments, will render strong supports for it necessary. The two uprights on which it swings, marked A, A, in the elevation, Fig. 3, should be of $1\frac{1}{2}$ inch wood. In Fig. 4 their exact shape is shown, on the larger scale of 2 inches to the foot.

Each of these supports is 9 inches broad by 20 inches long, exclusive of the tenon, 3 inches long, by which it is to be secured. In the plan of table, Fig. 5, will be seen at A, A, the places where mortises are to be made in the top of table to receive these tenons. It will be seen that the tenons will fall just within the knee-hole, and close to the partitions, to which they are to be screwed, as is shown more particularly in Fig. 6, which is also on the larger scale.

The tenons having been fitted in a temporary manner, we may remove them for a while whilst we cover the table top. American leather cloth is the best material for this purpose. The quality should be a good one; the colour may be left to individual taste, but a dark green or brown will be found to look well If in fixing the boards of the top the countersinking for any screw-heads has been cut a little too deep, the holes thus caused should be filled level with putty, or they will in course of time show through the oil-cloth. This done, the cloth is to be stretched tightly and smoothly over the top, and secured an inch or so below the edge, all round, with small tacks. These will be hidden by-and-by. To admit the tenons of the supports of the glass, holes will have to be cut through the cloth, and to do this neatly the cuts should be made as shown at Fig. 7, that is to say, a slit should be made at each end, and joined by another through the middle; the two flaps thus formed will fit down into the mortise beside the tenon, and no fraying at the edges will be to be feared. Of course, to allow of this the mortise must be made to fit easily at the sides.

By referring to the plan, Fig. 5, it will be seen that the oil-cloth covering is surrounded by a thin line of woodwork which, at the same time completely secures it in its place, and hides alike its edges and the tacks by which it is held down. We will add this woodwork, beginning at the front. The piece in question is that marked B, Fig. 3. It is a strip of $\frac{1}{2}$ inch stuff, 4 feet long by $3\frac{1}{2}$ inches wide. It is as shown, relieved by a little very simple ornament, and its upper edge should be slightly rounded. When it is fixed in place, which should be done with large, round-headed screws, this rounded edge should be slightly raised above the level of the oil-cloth—say the $\frac{1}{16}$ of an inch—to prevent pins or other small articles rolling from the table.

At the ends a much greater width of board will be needed for this purpose. The shape to which it has to be cut is shown at A, Fig. 8. Probably two widths will have to be joined. When, as in this case, a strong joint is wanted, and the workman lacks the appliances and skill necessary for making a good joint in the orthodox manner, a handy makeshift will be found in dowelling the edges together. Make the two edges as true as possible, bore corresponding holes in each, insert in each pair of holes a small wire nail from which the head has been cut, and drive the two boards together. There will be no danger of lateral movement in such a joint.

Completely to secure our covering of American cloth, we ought to continue the woodwork round the back of the table; but the woodwork will there rise to a height of 13 inches above the level of the cloth, and at present (except the supports of the glass, which we may now suppose to be permanently fixed) we have nothing to which to screw it—for the $\frac{1}{2}$ inch board, which we have just fastened to the table end, is not strong enough to give it sufficient support. We must, therefore, first prepare and fix in place those pieces marked C, in Fig. 3, and B, in Fig. 5. These should be of three-quarter, or, better, of inch wood, and their dimensions $9\frac{1}{2}$ by 7 inches. They will have to be crossed with ledgers, three in number, $\frac{3}{4}$ of an inch wide and 3 inches apart, much in the same manner as were the ends and partitions of the lower portion; the chief purpose of these ledgers being to support the jewel-drawers. These pieces can be attached to the supports of the glass and the thin boards at the ends, and also by a screw or two from below, through the top of the table.

The boarding of the back can now be carried on from the point at which it was before left off; $\frac{1}{2}$ inch stuff still being used, and screwed firmly to these same upright pieces. The shape and height to which it has to be cut can be measured from Fig. 3, which also gives the ornamental cresting, D, along its top with sufficient exactitude.

Above the jewel-drawers, at each side, it will be seen that a handy shelf is shown, measuring $14\frac{1}{2}$ inches by 8 inches. We may cut the pieces to form these shelves from $\frac{1}{2}$ inch board, and before fixing, cover them with American leather cloth, like the top of the table. A strip of $\frac{1}{4}$ inch wood (E, Fig. 3) will have to be screwed in front of each shelf, and will thus overlap and project before the front of the framework of the jewel-drawers. This strip is $1\frac{3}{4}$ inch wide, and should be slightly rounded above, like that in front of the table top, and

should, like it, be slightly raised above the level of the oil-cloth.

In Fig. 3 it will be seen that a strip of board, marked F, runs along the base of the table. So far as regards appearance merely, the effect would have been better had this piece not been carried across the knee-hole; but the arrangement adopted is so essential to the strength and solidity of our table, that elegance must, as is just, give way to sound construction. This strip is of $\frac{1}{2}$ inch wood, 4 feet by 3 inches. Its form is shown in the illustration. It mitres at the corners with the two corresponding strips of the ends.

With regard to the frame of the looking-glass, I need only remark that I suppose it to be made of inch stuff, with a backing of $\frac{1}{4}$ inch; nor will instructions be needed for things so simple of construction as the drawers. Those in the lower part I have made uniform in size and somewhat shallow—3 and $3\frac{1}{4}$ inches deep, inclusive of bottom; but they can be easily varied, and some made deeper if desired, at the pleasure of the workman.

With the drawers my dressing-table will be completed. In my next article I propose to show how I made my pedestal washstand and my towel-horse to match my dressing-table.

(*To be continued.*)

THE SPECTROSCOPE, AND HOW TO CONSTRUCT IT.

By O. BECKERLEGGE.

I.—THE COLLIMATOR—JAWS—BARS CONNECTING JAWS—MODE OF OPENING AND CLOSING JAWS—SIMPLE PLAN.

OF all the appliances of science of modern times, there are few, if any, more wonderful than the spectroscope, whether we consider the simplicity of its structure, or the marvellous revelations it discloses. Indeed, one feels amazed, as one always does, when a great discovery is made, that such wonderful facts have been so long hid, and at last have been made known by such simple means.

It will be understood that my work is not to discuss the history of the spectroscope, or to give an elaborate account of the results of its use: these matters are fully discussed in other books. I shall say as little on these points as is consistent with an intelligent understanding of the instrument, as to its structure and the work to be done with it.

Sir Isaac Newton, I presume, was one of the first to make experiments on the decomposition of light. Allowing a beam of light to enter a dark room through a round hole, he intercepted it with a glass prism, and found the white light spread out into a band of colours; hence the seven colours are called prismatic. For a time very little grew out of this.

It was, however, discovered that when a pencil of light passed through a very narrow slit, the solar spectrum presented dark bands or strips. Dr. Wollaston was the first to make this experiment. He first found two, but subsequently counted nearly a thousand. It appeared very manifest that there was a constant order in their position. Professor Fraunhöfer systematized them, and they have been subsequently called by his name; the position of the different lines being indicated by the different letters of the alphabet. Further investigations showed that when a given substance is raised to a state of incandescence, it stripes the spectrum, and that the same substance invariably produces the same coloured strip in the same part of the spectrum. Investigation was still carried on until most, if not all the elementary bodies known to us are so viewed, when the astonishing fact is revealed that no two substances present the same coloured strip in the same part of the spectrum. The strip then at once tells us by its position and colour what is the substance which has been raised to a state of incandescence.

Its utility will be seen in the fact, that a portion of matter too small to be tested chemically, is easily detected by this means. Thus it has been calculated that sodium may be detected in quantities not more than the millionth part of a grain. Thus, for example, if any substance chemically clean is left exposed to the atmosphere only for a few seconds, it will have received a deposit of sodium sufficient to produce the well-known orange line when raised to a state of incandescence.

Careful investigation showed that the spectrum of the sun, for example, was crossed by black lines, which occupy the place of bright lines in the spectrum of other substances. On experiments being made, it was found that when light from a given substance passed through vapour of the same substance, the light is quenched on the principle of *interference*, which I have already explained as far as necessary in my article on the Polariscope. We have here, then, a means of determining the constituents of any distant object which may be in a condition to emit light rays. By this means we determine the existence of many of the metals and other elements we have in the earth to be in the sun, and even in the more distant orbs.

Having said so much on its nature and use, we will at once pass into our amateur workshop and begin to construct. We will consider the *essential* parts of the instrument which we are about to make. First, we must have a collimator to direct the beam of light;

next, a prism to defract it ; and, lastly, a telescope to view the spectrum when formed. There will be other matters of detail, especially a stand to hold the instrument, some appliance to read off the angle of defraction, etc., but the three points we have indicated are essential. It is true an instrument is constructed, the direct vision,—in which collimator, prism, and telescope are combined in one tube, but that is a much smaller affair than the instrument we are now about to make.

Our first work shall be to construct the collimator, which is the name applied to the part which directs the ray of light. It will be understood from our introductory remarks that the light must issue from a narrow slit. Now as far as skill is shown, this will be the most difficult part of the work. There are two methods of constructing the slit—one, to make a fixed opening, the other, to construct it so as to be adjustable, that is to say, the slit can be made wider—within certain limits, or be completely closed. I will describe the more difficult mode first, the easier one afterwards. In my own instrument I have adopted the more difficult arrangement. One has more pleasure in overcoming greater than lesser difficulties. The pattern I adopted is the parallel ruler type. Take a piece of brass $2\frac{1}{2}$ inches in diameter by $\frac{1}{8}$ inch thick. Find the centre, and strike a circle $2\frac{1}{4}$ inches in diameter. Make the faces of brass fairly clean and level before beginning. Bore a central hole $\frac{1}{2}$ inch in diameter, and countersink it on the opposite side to that on which the large circle is drawn. Cut off a strip of brass $2\frac{1}{2}$ inches by $\frac{3}{8}$ inch, and $\frac{1}{8}$ inch thick, file it up nicely true. Now bevel off one of the long sides to a knife edge, as in Fig. 1. To make it quite true, see before you begin to file back the bevel that the edge is perfectly straight, then draw with a sharp point a line $\frac{1}{8}$ inch from the edge, and file back to it. By this means you will secure a sightly and correct job. Cut the prism or wedge in two equal parts, and when completed, ends filed off true, etc., they will be about $1\frac{1}{8}$ inch long. Now place them on the central hole, flat side down, and with knife edges together. If the edges are perfectly true, which they will be if carefully made, no light will pass through. Should there be any hollow or roundness, then take a flat fine-cut file, and steadily pass the knife edge along it—don't draw the file over it, but the brass over the file. Take what roughness there may be by rubbing it over an oil-stone. Do this carefully, and a perfectly *light tight* joint will be the result. Now take a gauge, such as a carpenter uses, and draw a line down the opposite edge to the knife-edge $\frac{1}{8}$ inch back, also across each end. Carefully mark where these lines cross, and make a mark with centre punch. This must be done very carefully and with the utmost exactness, for if there is not something like absolute truth in this matter, you cannot have a true slit. Lay the jaws—as we in future shall call them—edge to edge, and with a pair of fine pointed compasses see if there is the same distance across between the marks, also lengthway. Supposing we are quite satisfied, we proceed to bore four holes in the punch marks. If, however, there is any difference between the width of punch marks, then a file must be carefully used on one or both knife edges, so that the difference in width may be rectified, and the punch marks in one jaw be perfectly parallel with those in the other. I must be pardoned for being so minute on this point, for if attended to carefully, much subsequent bother will be saved, and "What is worth doing, is worth doing well."

We now want two bars to connect the jaws together. For this we want two strips of thin brass, $\frac{3}{4}$ inch by $\frac{1}{4}$ inch, file them up together so that they may be the same size. Make a central mark in each. With a compass make a mark each side of the central mark not less than $\frac{1}{4}$ inch, so that there shall be full $\frac{1}{2}$ inch between the extreme marks. Draw a central line the length so as to cut through the three marks. Where the lines cut these, centre punch and bore holes. When the jaws are put parallel with bars across—with holes in bars over holes in jaws—we shall find the latter separated by, say $\frac{1}{8}$ of an inch. Out of $\frac{3}{16}$ brass wire or rod make four screws, tap the holes in the jaws, slightly enlarge holes in the bars, put in the screws, and file off the projecting ends of same, and we have a pair of diminutive parallel rulers. Measure the distance between the central holes in the bars, and when you have drawn a line across the diameter of the disc, make two marks, one on each side of the opening, the exact distance we measured between the central holes in bars, bore holes, and screw. Now make two bolts like those we made before, only a little longer, and screw the jaws on to the disc, on the opposite side to the countersink. If we made two small washers to go under the heads of those screws, there will be less danger of the bolts unscrewing with the motion of opening and closing jaws. You will now find that the central bolt will prevent the jaws closing. You will first determine in what direction you intend closing jaws, and then carefully file away the knife edge, which bears against the bolt until the jaws will perfectly close. This seems a little matter, but it requires care, else you will find, as I did, that you have filed away just a little too much, and when the jaws are closed, at one end there will be a minute hole which will let the light through. I had to find this out for myself, and had to make a second pair of jaws as a consequence. I wish to save you the trouble and disappointment.

We have the jaws. Now for the means of opening and closing the same. Procure a piece of brass wire as thick as a knitting-needle or birdcage wire; bend it as A, in Fig. 2, fasten it with a screw, and with a second give it leverage, *b*. This acting on the end of lowest jaw will push it up, causing it to open. To close it, make a screw to act on the opposite end of the same jaw the spring acts upon. This will close it to any required slit, and the two forces acting in opposition will give a smooth and continuous motion.

FIG. 1.—COLLIMATOR JAWS IN PERSPECTIVE.

I claim no originality in this arrangement. Indeed, it has been *invented* several times over. The only difference I have made in mine, as compared with what I have seen is, I have made my screw to act diagonally on the jaw, which gives greater freedom and power. Fig. 1 gives an enlarged view of jaw. Fig. 2 the mechanism complete. Next procure a piece of brass tubing $2\frac{1}{4}$ inches in diameter, and $1\frac{1}{2}$ inch long. If you cannot get the exact size, then get a little larger. Cut a piece out and solder the joint. I find in practice this is easily done. There will be a tendency for the ring to be a little long on the side of the new joint, but you can make it a very fair circle. A good eye is a capital thing. It is surprising how nice the eye is when trained to discover inequalities. When in good form, file up the ends true. A new rough-cut file will be required, with a small steel square, and a perfectly level surface to try it on. You may file up the ends as true as they could be cut in a lathe—of course, not so easily or so quickly done; but if you are working for love and not for profit, the time is not of so much consequence. See that the side of the disc on which the circle is struck, and on which the jaws are fastened, is perfectly bright and clean.

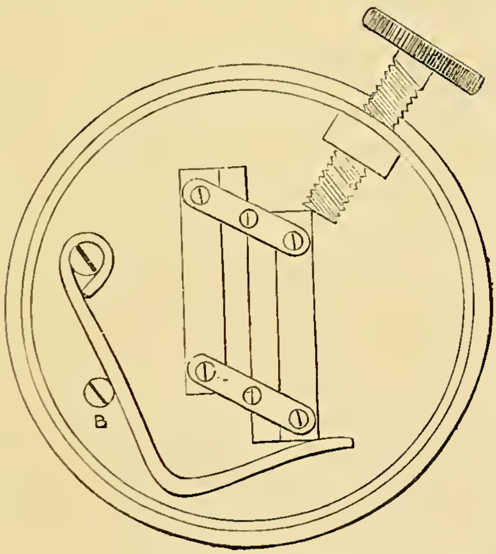


FIG. 2.—COLLIMATOR CAP, COMPLETE, WITH THE JAWS CLOSED.

Take spirits of salts killed with zinc. To make it, procure an ounce of muriatic acid, put it in a four-ounce bottle, and drop in it bits of zinc until it will dissolve no more; better do this in the open air, for the fumes thrown off will violently attack iron goods, and cause them to rust. Moisten edge of ring with a drop, and run the soldering-iron around so as to give it a coat of solder. Now place it on the disc, guiding its position by the circle marked on it. Moisten the joint with the fluid, and run around solder; do it carefully, and a good job will be the result.

At a point indicated in Fig. 2 drill a hole, and out of a piece of brass make a nut; tap it, and solder it to the inside of the tube, against the hole. With a piece of the stout wire before mentioned, make a screw-bolt (say $1\frac{1}{2}$ inches long) to fit nut. With a bit of sheet brass make a head for same, thus: Make a centre-punch mark, describe a circle $\frac{3}{4}$ inch diameter. Drill a hole, insert one end of bolt, and solder. Now file off neatly to the circle. The result will be a good headed screw.

We have now to file off the edge of the disc true, just leaving a projecting edge $\frac{1}{16}$ inch outside the tube; this will give a finished look to the whole. Of course, one with a lathe will do much of the work with it, the result being all the more *eyeable*, but I am writing principally for those who have little else beyond a good file and a true eye.

I have got a friend to turn and mill my work, which certainly gives it a finished look. Perhaps some of my readers can go and do likewise.

I will now describe a simpler plan, which one may adopt who does not care for the nice bit of work which the method described requires. Draw with a sharp point a line through the centre of the disc, after having finished the jaws up to the point when they are ready for the screw-holes. Lay them on the disc, and when they are on the centre of hole (which you can determine by the line drawn across the face of disc), with a touch of solder tack them in their place. Now drill four holes—one in each end of jaw. Make screws, and fit in nicely. When complete, detach the jaws, and give each one a few rubs on its knife edge on an oil-stone, carrying the hand steady and true. Now screw up, and see what slit you have—it should be about the hundredth part of an inch. See that the line of light is the same thickness each end. The opening will just admit ordinary

writing-paper. If you do not get what you want at first, take off jaws, and give another rub or two; do not do too much at a time, as you can easily take off, but cannot put on. To make the opening too wide means the making of a new jaw. I should advise that the final correction be left till the other parts of the instrument are complete—it will be easier to determine, when viewing the spectrum through the telescope, when the proper slit is arrived at.

When complete, the edge must be perfectly free from dust or raggedness, as either would give black lines at right angles with the spectrum line. The jaw now described is the one used for small pocket spectroscopes, which will not admit of a regulating screw. If it be preferred, the countersink may be turned inside, and the jaws screwed on the outside. It is sometimes done, but the way I have described, I think, looks less heavy.

(To be continued.)

HELP FOR STRUGGLING AMATEURS.

By PITCHPINE.

IV.—OLD TOOLS VERSUS NEW TOOLS—CHISELS—MALLET—HOW TO MAKE IT.

LET me tell you an experience I had when I was just beginning to find out what a splendid hobby wood-working might be to a man whose inclination lay in the direction of mechanical labour. I was watching a carpenter at work, and marvelling at the ease and precision with which he faced and squared up a board by means of what appeared to me a battered and worn-out old plane—a tool which, at the time, I would not have accepted if it had been offered me. I threw out what I considered a few delicate hints as to the condition of the tool, and by implication praised the skill which could produce good work with such an unpromising instrument; but I soon found that I was talking about a subject of which I was profoundly ignorant. Kindly enough, he pointed out to me that although the general appearance of the tool was not prepossessing, the actual working parts—viz., the sole and the cutting iron—were in perfect order. The plane had, at some previous date, been fitted with a new sole—that is to say, a piece of beech had been screwed on to the bottom of the plane, which had worn down so far as to necessitate it; and this in its turn had been faced up more than once, but it was still true, and while that was the case, it was in working order. I was surprised (at the time—I can understand it now) to find that my friend the carpenter would not exchange his plane, battered and old as it was, for a brand new one from the maker. He had no sentiment about it either; no old associations or anything of that kind, troubled him: it simply was, that having worked with that tool for more than twenty years, he had become so accustomed to the feel and working of it, that he could use it with more ease and to greater advantage than he could a new one.

You want to know why I tell you this? Well, just for this reason: About the time you have got together the few tools previously mentioned, and are beginning to feel a little more at home in the use of them, you experience a strong desire to get rid of your old and second-hand tools, and indulge recklessly in new ones. You think you could do so much better with them. You fancy, for instance, that if you had one of those beautifully finished iron planes you could immediately and for ever bid farewell to all the little difficulties that beset you whenever you commence to plane up a piece of board, or, worse still, when you attempt to shoot the edge for the purpose of making a glue joint. This is just where you make a mistake: it is not the plane that is at fault, but your want of practice; and all the errors that you make now would only be exaggerated by the use of a new tool that you are not accustomed to handle. You may take my word for this, and quietly settle down to master the use of such tools as you have, and those which you have still to procure to complete your stock.

The next thing you want is a set of chisels, for you cannot do much work, except in rough carpentry, without them. Each time that you make a joint (unless it is a glue joint) you require a chisel. They are of three kinds—viz., paring, mortise, and firmer. As the latter will do the work of both the others, it is of course the one for you. It is but seldom that an amateur gets a job so heavy that the firmer chisel will not do all the mortising required. I have only one mortise chisel in my tool rack, and that I have seldom used; yet in making the pieces of furniture which I have previously described in these pages, and much more besides, I have found the firmer chisel equal to all emergencies. I do not advocate buying chisels second hand: they can be purchased so cheaply now, that it is not worth while getting a half-worn one for the very small reduction which a second-hand dealer generally makes on these tools. The most useful sizes are $\frac{1}{4}$ inch, $\frac{1}{2}$ inch, $\frac{3}{4}$ inch, and 1 inch; the prices when new being respectively, 6d., 7d., 8d., and 9d., including handles. These will be enough for a start. If you find that you require any other size, you can get it when the need arises.

Don't forget that a chisel handle must never be struck with a hammer, unless you want to split the handle, when it will be quite as suitable as a flat iron or a paving-stone for the purpose. A mallet is the proper tool to use, but a good-sized one costs, new

from 1s. 6d. to 2s. This is too much, when you can make a good one for yourself, for an expenditure of about sixpence. The way to go about it is this. First of all find a wheelwright's shop, introduce yourself to the wheelwright as an amateur carpenter, and ask him if he has a piece of waste beech about that will do for a mallet head. The chances are ten to one that he will have half-a-dozen pieces lying about, that will make splendid mallet heads, with hardly any alteration to their existing shape. He may not ask any payment for a piece, but at any rate you cannot very well go away without giving him twopence, and if you increase the donation to sixpence, he will probably make the mallet for you, such at least was my experience in the matter. At all events, you can easily make it for yourself if necessary, and the best guide you can have is to ask your friend, the wheelwright, to allow you to see the mallet he has in use—you will then get an idea of the shape, and method of inserting the handle ; but his mallet will probably be rather larger and heavier than you will require, in which case you will make yours a little smaller ; but don't get it too light, as it is better to err in the opposite direction. You will find that the handle of the mallet is mortised into the head, and it has just occurred to me that as you have no mallet for present use, and are prohibited from using a hammer as a substitute, you will experience some difficulty in cutting the mortise, unless you can borrow a mallet from a friend for the occasion. If you cannot surmount this difficulty, another method of putting in the handle will be to make a hole with a three-quarter inch bit. Don't let the hole go quite through the head. Shape the top of the handle to fit the hole nicely, split the end with a saw cut, insert the thin end of a small wedge of hard wood, then drive the handle into its place. When it gets to the bottom of the hole, the wedge will be driven further into the handle, forcing the two halves apart. This will fix it firmly and immovably in its place.

One advantage of this method is that it will give you an opportunity of using your brace and bits, which is the next tool that you are going to add to your stock. Having reached the end of my space, however, I must defer this and a few other matters that yet demand our consideration until another time. Meanwhile it will be well to ponder carefully over and lay to heart every word I have advanced with regard to the retention and use of old tools and their superiority in the hands of the amateur, who has been accustomed to use them, over tools which are new, and which want of skill will prevent him from handling for some little time with good effect. With tools it is much the same as with friends ; old ones to whom you are accustomed are, as a rule, better than new ones. (*To be continued.*)

DECORATIVE CARPENTRY.

By J. W. GLEESON-WHITE.

XII.—SPECIAL TREATMENT OF DRAWING-ROOM (*continued*)—OVERDOOR—COLOURING OF ROOM.

RESUMING the special treatment of the drawing-room with carved pillars and pilasters obtained from bed-posts, we come to the overdoor, whose fitting is very much more simple than that of the overmantel. In the one erected, the posts were used in the round : the base, not being sufficient to bring the capital of the post to the required height, was lengthened by another square piece of wood the requisite size. This would have been better if hollowed or worked into panels to receive the lincrusta, but for the sake of economy it was used simply plain, with the lincrusta applied in a narrow *quasi* panelling: the posts lengthened to size, were fixed against a piece of plain wood lining, the thickness of the permanent skirting of the room, which had been previously fixed at either side of the doorway outside the moulding, and connected by cross-pieces above the door, at distances to allow a row of 4 inch tiles being placed between it and the moulding. A frieze was made exactly as described for the overmantel with lincrusta decoration, while the panels of the door were themselves filled with lincrusta of the same pattern, the one that was used being catalogued as No. 167, at 2s. per yard.

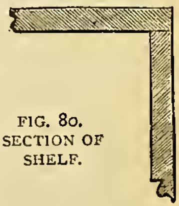


FIG. 80. SECTION OF SHELF.

There is another part of the same room which, while perhaps not by any means fulfilling an everyday need, may yet be a hint of another use for these posts. There, as Fig. 80 shows, a structure has been made like the overdoor, but this serves as the frame to an oil-painting too large to use as a picture in a room of the size described, and being worked into the design of the decoration of the room itself, it suits the purpose admirably. A mirror may take the place of the picture, as shown. The posts were fixed as for the overdoor, but a wide solid shelf of wood 4 inches square was added just above the level of the old oak chest in front, while Persian silk draperies were put to screen the picture from view, or from the glare of the sun when needed, these being simple curtains running on a brass rod between the posts. For those who do not object to imitations, the panels of the oak chest may be filled (if not of carved wood) with lincrusta panels, either gilded all over or painted the colour of the oak, or in accordance with the colouring of room.

To bring all the room into harmony, the whole of

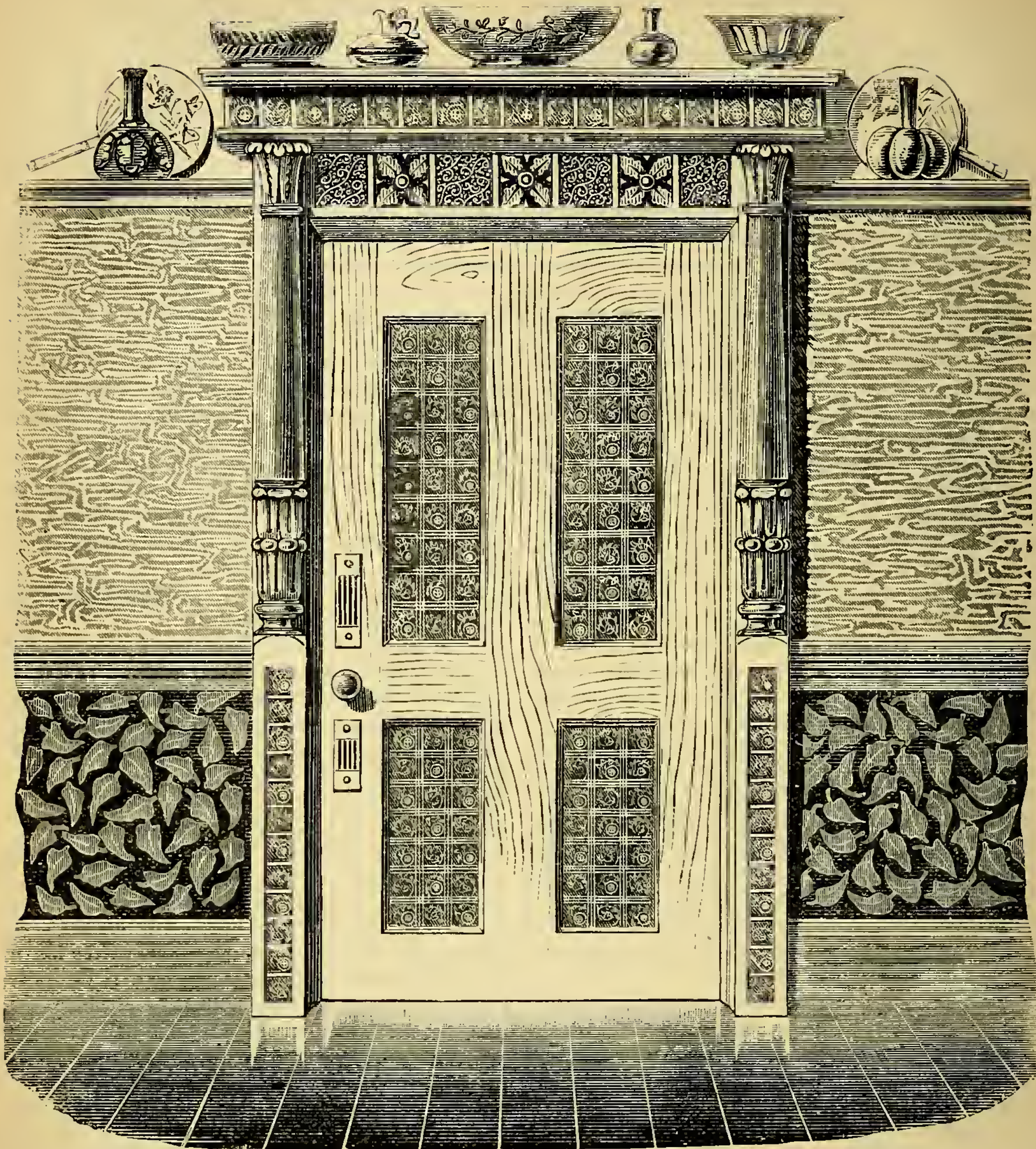


FIG. 79.—OVERDOOR FOR DRAWING ROOM, SUPPORTED ON PILLARS ADAPTED FROM BED-POSTS.

the woodwork is painted a dull grey black, unpolished. A wide chair rail, Fig. 79, is fixed at the usual height. The lower paper is of Japanese leather (black and gold), the upper one all gold. A shelf 3 inches wide runs round about 15 inches below the ceiling, following the whole room. Above the shelf a dull salmon colour plain distemper is painted on the wall, and some 8 inches over to the ceiling, which is papered with a salmon and white paper with a border —the whole colour being low in key, but not heavy, and giving a very pleasing effect. A few Persian rugs and Indian dhurries of rich colour, give warmth to the room, while the furniture, all of old oak, or modern ebonised wood, without gilding, does not

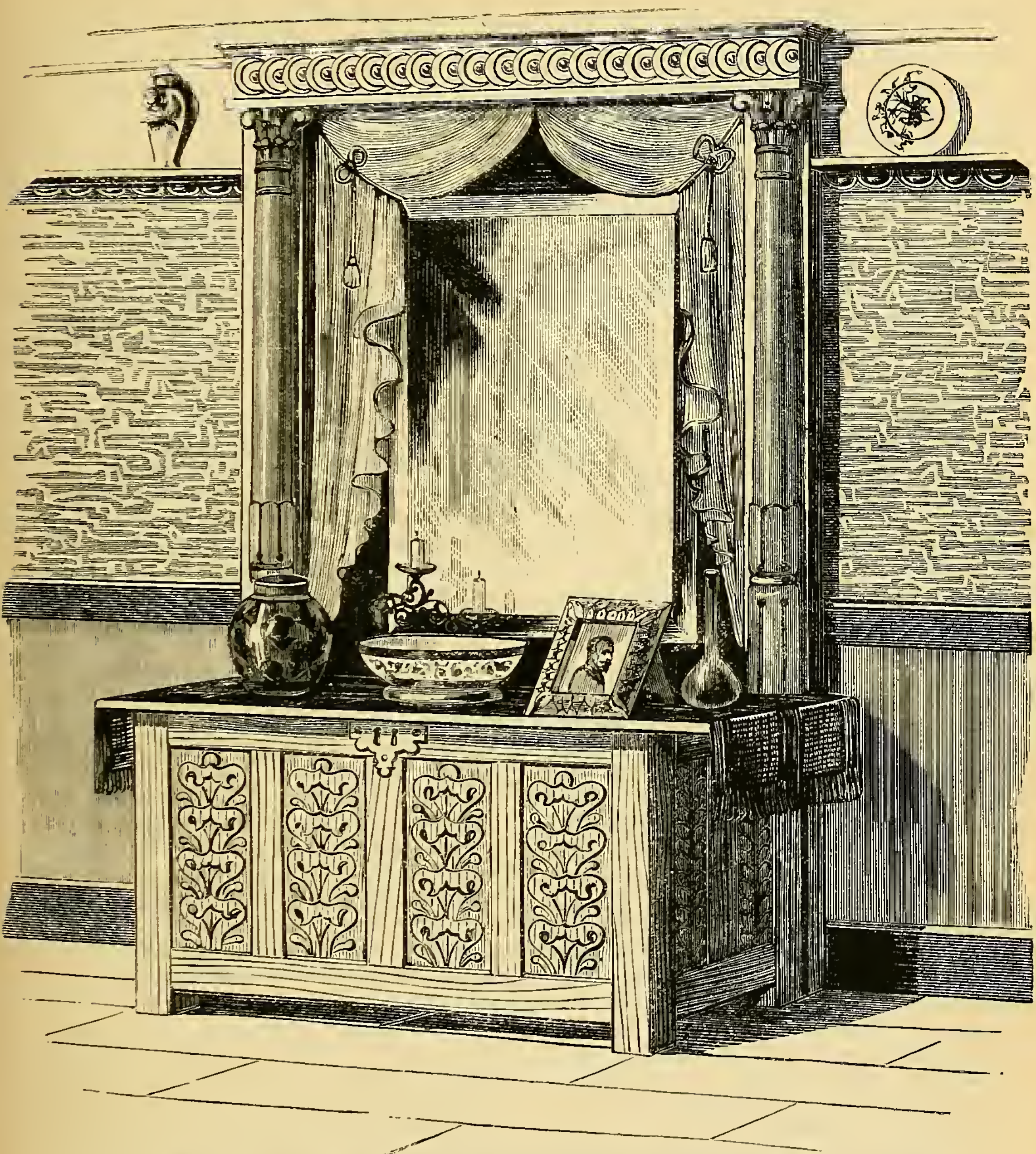


FIG. 81.—CARVED OAK CHEST WITH PILLARS FORMED FROM BED-POSTS SUPPORTING DECORATED FRIEZE.

detract from the general effect. Plenty of china, glass, and brass, make the room look anything but heavy; and while the bed-posts are perhaps distinguishable after careful inspection, they do not suggest their origin to a casual observer, and are the secret of the good effect of the whole room, which has an appearance of solidity, rather grateful in these days of so much flimsy and specious adornment. The cost was not very great, the actual woodwork, posts included, for the whole room, with labour, including shelf all round the room, and moulded chair rail, being about £4, the lincrusta about 12s. This does not include cost of painting, nor of the Japanese leather paper, which Messrs. Hindley supply from about 15s.

the piece. It should also be noted that the price for labour was that paid to an ordinary jobbing carpenter, under personal supervision; no doubt if put into the hands of a tradesman to carry out, higher prices would result.

I may add that, in spite of the above room being a success, one feels how much better the old mahogany unpainted would have looked and worn, that if by any method it were possible to avoid painting it (the chief difficulty being the varying colour of the old work, one piece light and another dark), I would urge on anyone who contemplates "An Adaptation in Bedposts," to make every effort to use the natural surface of the wood.

(*To be continued.*)

FISHING TACKLE:

ITS MATERIALS AND MANUFACTURE.

By J. HARRINGTON KEENE.

V.—TACKLE FOR PIKE, EELS, AND PERCH.

IN commencing this chapter I am sensible that it is quite impossible for me to do justice to so vast a subject in so short a space as remains at my disposal. There are three methods in vogue for the capture of the pike, and the constant varieties of tackle which present themselves according to the tackle-maker's fancy and the angler's whim—for the fish would seem but scantily consulted—in use for these three methods are bewildering in their number, and quite impossible to reproduce in their entirety here. I shall, however, seek to ground the amateur who has followed me so far, in the manufacture of the chief appliances, and must leave his own observation and aptitude to do the rest. Spinning, trolling, and live-baiting are each and all practised by most jack fishers, and I propose referring *seriatim* to them.

Spinning is looked upon as the most sportsmanlike, and, perhaps, a greater variety of tackle is made for its pursuance than for any other form of angling, except fly-fishing The word applies to the motion of the bait which revolves, or spins, in its passage through the water with a velocity proportioned to the perfection of its position on the hooks. One of the simplest and best of these "flights," as they are termed, is shown at Fig. 50. A is a double hook, tied on gimp, of a gauge corresponding to the supposed size of fish sought to be caught; B is a triplet placed on a double gimp for extra security; and C exhibits the lip-hook, which is inserted in the mouth of the bait to keep it in its place. One word about lip-hooks generally: they are intended to slip on the gimp, or gut, by means of two loops attached, one at the bend and the other at the end of the shank. These loops are of gimp, or of steel, and the latter are made with the hook. After insertion in the mouth of the bait a twist is ordinarily taken round the bend to prevent slipping. A is intended to bend the bait's tail (which would be that of a dace, etc.), but with the baiting we here have very little to do, the manufacture alone being our subject.

Fig. 51 shows another kind of flight, almost of the same make, but claimed by some to be superior. In this case A is looped on to the main gimp, and a triplet hook dangles behind. Another triplet is placed higher upon the gimp, and a lip-hook of the customary pattern is also employed.

Fig. 52 completes the trio of what I consider the best *unleaded* flights of spinning hooks made. I say unleaded, because in some of the others I give further on, you may see that the lead for sinking the bait in the water is contained in the bait, instead of being on the trace, as I shall presently explain. This tackle is perfectly simple, and consists of one single hook, and one triplet; the lip-hook is, as a matter of course. It is dressed on stoutish gimp. Let me here refer for one moment to the whipping of hooks on gimp; be careful that you withdraw a small length of the enwrapping wire and overlap the forks of the triplets with a little of the fibre, bringing it down on the shank. This causes the whipping to be very secure, and gives a better finish if done with care.

In Fig. 53 we have a singular but very effective invention for the doing away with the bent tail and weighting the bait at the same time. To describe the weapon *in extenso*, it consists at A of a lead barrel through which a brass pin runs, terminating with a hook. This part can easily be made from an ordinary barrel lead, see Fig. 63, and a large blanket pin. The part B consists of a disc of metal cut from the outer edge into equilateral flanges, six of them. They are bent in the shape shown to somewhat resemble a screw propeller, the action of which they imitate. The centre of this is bored to admit a piece of piping, which is fitted by soldering (see C); A terminates at the upper end, in a ring to which a swivel, D, is ringed. The lip-hook at E is attached with this ring, and this, with the three triplets on gimp depending from the other side, completes what has been named "The Fishing Gazette" Spinner. The pin, A, in baiting is thrust down the throat of the bait until its mouth arrives at C; the hook, F, keeps it in its place. The lip-hook is thrust in the back of the neck, and the other hooks are disposed around the body. When the whole is drawn through the water, the fans, B, cause very rapid revolutions, and the result is a most attractive

spin. It is a very creditable invention of which Mr. Marston, of the "Fishing Gazette," might well be proud.

An arrangement designed for the same purpose, is shown at Fig. 54.

This may be easily made if one can braze or solder pretty fairly. A is a pin with a loop at the head; C represents a hook which is pushed in together with the pin through the barrel lead (these leads can, of course, be readily purchased and adapted to their purpose); B exhibits the flange, which is cut out from a piece of sheet brass, and carefully inclined and curled either way, as shown. Curiously the flange in Fig. 55 shows the exact flat pattern (through a mistake in the shading). This flange is then fitted into the lead either by sawing it down about a quarter of an inch, or it is fitted to the pin A, previously to anything being done at all. Perhaps this is the better way, but it involves soldering, and the latter process does not, as the lead itself can be closed sufficiently tight to obviate its slipping out. If the upper part of the flange close to the ring be beaten thin, the closure of the lead is additionally secure. Fig. 55 shows the mounting in its entirety; of course, all the tackles here shown can be varied as to size, as occasion requires, though these represented are the ordinary dimensions.

The foregoing are the most difficult of the spinning tackles in ordinary usage, and yet are by no means difficult to make. Those of the artificial baits to which I am about to refer are, in some cases, the work of skilled metal-workers, and cannot, of course, be made without great expense for adequate machinery. There are very many which are not here figured that can be manufactured by the amateur, and in none of them, except the most fantastic, is there real difficulty for those who are disposed to go to the expense. In the latter case, however, the game is never worth the candle, for some simpler arrangement will probably be found better in actual practice.

Fig. 56 is a metal artificial bait, which, twenty years ago, was known to me as the "devil killer," probably in allusion to its remarkable killing powers. It is formed by a barrel of bright metal, with flanges on each side, and is even now ranked amongst the good artificial baits of these latter days. Obviously it is quite impracticable to make without the proper machinery; Fig. 57, however, though it appears more difficult, is not so in reality. Its body is gutta percha, and time and trouble may very profitably be spent in its manufacture. The tail is a slip of quill, and the fans are of German silver or brass. The eyes are light-coloured beads. Of course, the gutta percha must first be softened in hot water, and then forced into a mould A plaster of Paris mould of a minnow can easily be made, and when dry and hard will serve as well as metal. The fans are rather tedious to set properly, and should be put in separately, when the gutta percha is still soft, as should also the tail. Similarly a piece of brass pipe is forced through the body of the tiny imitation, and this serves to contain the gimp or gut of the tail triangle. The eyes are pressed in, a couple of beads will do as well as the closest imitation, inasmuch as that the bait gyrates with great velocity. Of course, the bait should be painted, in order to render it as close a resemblance as possible to the original. Judson's gold and silver paints are extremely useful for this purpose, and the reds and greens need not be particularized. A second triangle is placed, as shown. Fig. 58 is a very attractive bait, made entirely of nickel, and painted with red fins and splashes of red elsewhere. This also is one of those it is not worth while to make yourself, and, as a fisherman, I cannot recommend you to buy it.

Fig. 59 is not intended for fresh-water really, but is nevertheless a killer where pike abound. A represents a hook, on the shank of which is a large drilled shot. Over this is drawn a piece of red india-rubber tubing, represented at C; B at the extreme shank end represents flanges of metal, whilst a swivel at the extremity completes the bait. For some kinds of sea-fishing it is very effective, for there is an extremely worm-like appearance about it when rushing and revolving through the water.

Fig. 60 shows an American bait, which on its arrival here did great deeds of "derring-do" amongst the pike. It consists at A of a spoon either of bright bronzed or reddened metal. B is a barrel lead on a shaft connected with a "Fishing Gazette" Spinner at C. This shaft passes through the spoon twice—at top and bottom; it is connected at bottom with a tasselled triplet, and this tassel may be of scarlet wool and gold tassel, or it may be of gaudy feathers. I prefer the former, and this is how it should be dressed: Take the triplet between thumb and finger of the left hand (hooks being between them); now select your scarlet wool and pass it up to the ring of the hook. With two turns of the waxed silk make it fast there; now attach your tinsel in a similar way, and having stroked the wool evenly down, wind, as shown spirally. Twist your waxed silk tightly once or twice more around, and fasten off. You can, if you choose, spin a fibre of wool around it first. Spin some thick wool on the remainder of your silk, and tie both tinsel and wool round tightly at the bottom of the hook opposite the fork. Now arrange the feather over the forks of the triplet and your artificial bait is finished. A similar set of instructions might be given in reference to Fig. 61. This is a bait differing in that the spoon flies loose, as depicted round the shaft at A as the bait moves through the water. This is a highly effective bait for large fish.

Thus endeth the "artificials." It is not probable the amateur will make all I have given, but it is meet that one or two find their way in his tackle-basket, especially the gutta percha minnow. The "phantom" soleskin bait, patented by Messrs. Little, of *Fetter Lane*, quite deserves extended mention. I can only here, however, say that it is composed of prepared soleskin painted; that it is, of course, hollow, and becomes inflated as it is drawn through the water. Its colours are those of the trout and parr, and it is chiefly in request for salmon. Pike would probably destroy it.

The next thing demanding attention in connection with spinning is the "trace." This is the line to which the bait is attached. Generally it is composed of gimp, and is about three feet long. Twisted gut is also used, and I prefer it, but, on the score of expense, gimp is preferable. A three feet gimp trace is usually broken in three places to admit swivels, and I prefer these double, as in Fig. 62.

I do not recommend them to be quite so large as the drawing, but double they should be and of brass, for steel is so apt to rust. The first swivel is placed just the other side of the loop, which should be whipped into the loop of the swivel very securely. The next swivel at a foot's distance, and the next just before the lead. The lead is what is called the "barrel" lead, and it is very useful in all its sizes for all sorts of things. Fig. 63 shows it as it should be when placed *in situ* on the trace. It is better to loop it on to the gimp as shown, because it then hangs dependent, and is with the swivels a sure preventive of that curse of spinners "kinking," a term applied to the state of tangle occasionally befalling even the best arranged and used tackle.

Live baiting for pike is by no means so full of

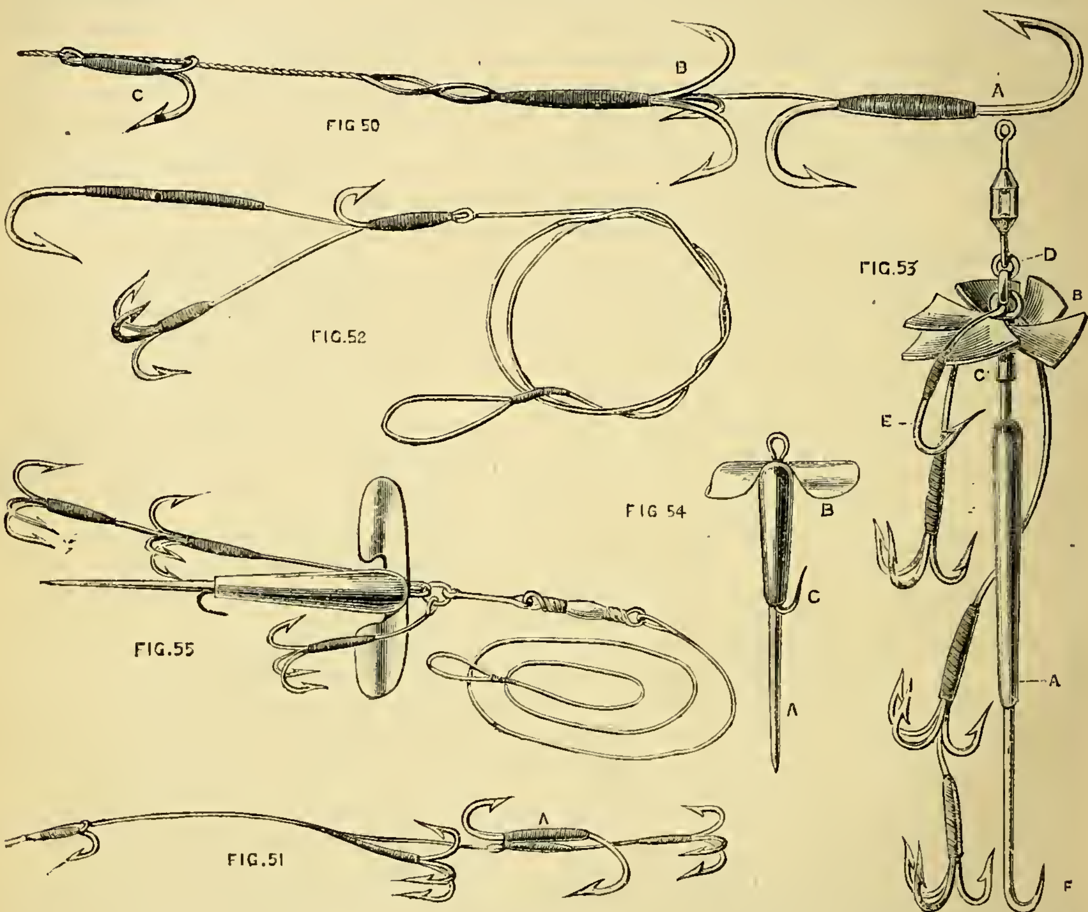


FIG. 50.—"FLIGHT," CONSISTING OF DOUBLE HOOK, TRIPLET, AND LIP HOOK, TIED ON GIMP. FIG. 51.—ANOTHER FORM OF "FLIGHT." FIG. 52.—ANOTHER USEFUL UNLEADED "FLIGHT." FIG. 53.—CONTRIVANCE FOR WEIGHTING BAIT AND DOING AWAY WITH BENT TAIL. FIG. 54.—LEAD WITH PIN AND HOOK. FIG. 55.—COMPLETE SET OF TACKLE FOR PIKE, MOUNTED AND FINISHED.

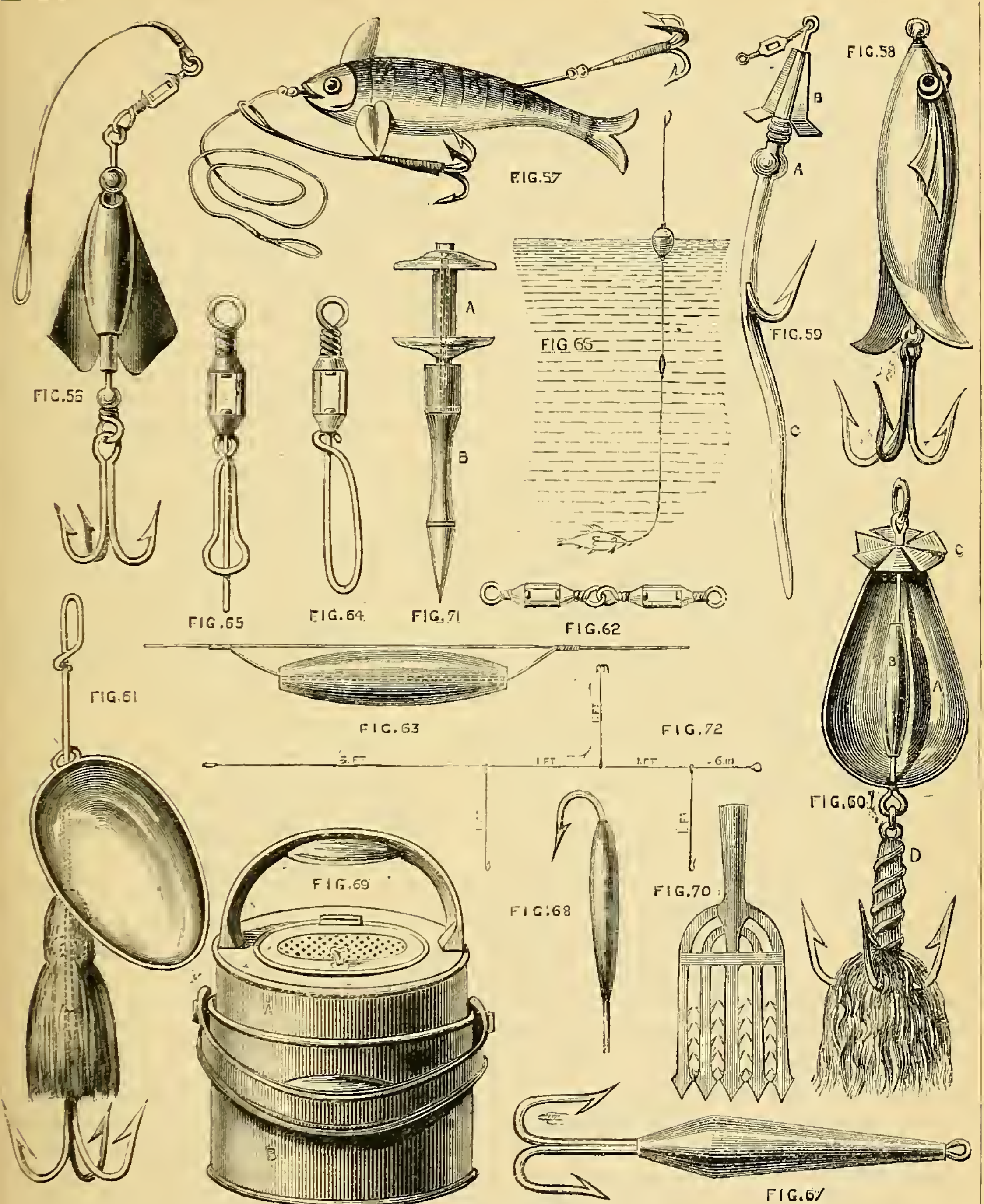


FIG. 56.—"DEVIL KILLER." FIG. 57.—ARTIFICIAL SPINNING BAIT IN IMITATION OF FISH. FIG. 58.—ANOTHER FORM OF SPINNING BAIT. FIG. 59.—INDIA RUBBER SPINNING BAIT FOR PIKE. FIG. 60.—AMERICAN TASSEL BAIT FOR PIKE. FIG. 61.—SIMILAR BAIT WITH MOVABLE SPOON ON SHAFT. FIG. 62.—"TRACE" FOR SPINNING. FIG. 63.—BARREL LEAD TO BE FITTED TO TRACE. FIG. 64.—TRACE FOR END NEAREST HOOK. FIG. 65.—TRACE FOR TOP. FIG. 66.—APPEARANCE OF TRACE, HOOKS, AND BAIT WHEN COMPLETE. FIG. 67.—WEIGHTED HOOK FOR TROLLING. FIG. 68.—ANOTHER FORM OF WEIGHTED HOOK. FIG. 69.—BAIT CAN. FIG. 70.—EEL SPEAR. FIG. 71.—BOBBIN FOR NIGHT LINES. FIG. 72.—"PATERNOSTER" TACKLE FOR PERCH.

sportsmanlike feeling as spinning. The hooks for live bait are generally a good double one, and a single lip-hook, or a triplet and lip-hook. The trace is ordinarily of about a yard of gimp, and two swivels are generally employed, as represented in Figs. 64 and 65. Fig. 64 is usually placed at the end nearest the hook, and Fig. 65 at the top instead of a loop; a stout cork float, and a barrel lead held half-way up to it from the bait, completes the tackle. For simplicity and killing power I do not suppose any tackle soever can rival this. Fig. 66 attempts to show the *tout ensemble* of the trace and hooks baited.

Trolling is a very ancient style of fishing, as I have elsewhere indicated. It consists, in respect of tackle, of a weighted hook, of which Fig. 63 is a very sufficient indication. This is drawn into the stomach of the bait from the mouth by means of a baiting needle, which can be made in five minutes from a piece of brass wire. Of course a length of gimp is attached to this, and this is generally a couple of feet in length. A swivel, as in Figs. 64 or 65, completes the gorge hook. A gorge hook may very efficiently and readily be made by whipping on a double hook to a length of gimp, and before adjusting the swivel drawing on a large barrel lead, as Fig. 63. It is gently pinched so as to close on the shank of the double hook somewhat low down, and one then has an amateurish but perfectly serviceable hook. Fig. 68 can be made in the same way, and really I don't know which to prefer for efficiency. Certainly the manufactured ones cost more money, and that alone is sufficient recommendation in the eyes of many.

Fig. 69 show the last but not least important item of outfit of the pike fisherman—namely, a bait can. This ought to be made by the amateur if he can use the soldering iron at all. It consists of an outside receiver, B, which encloses an inside perforated one at A. The perforations are not shown, but the receiver should be made of coarse zinc netting, so that on arriving at the water the inside receiver can be lifted from the stale water in B, and placed in the stream. Of course this arrangement also facilitates the catching of any particular bait from the can.

Eels are remarkable and peculiar fish, though it is not so very hard to catch them; of course, the readiest means is to watch the air-holes in summer time, and sharply plunge down a spear, such as Fig. 70 represents. This simply is composed of thin bars of iron serrated and fixed as shown. I have seen them home-made, with teeth fixed to a crossbar like a garden fork. The crossbar need only be of good hard wood, only such as holly or well seasoned oak, if the spines are put in firmly, but do not forget that iron and wood, as a rule, do not bear on each other remarkably well. A good straight, ash pole is necessary for a handle.

If the angler prefers setting night lines he can do this, winding his lines on a bobbin similar to Fig. 71. I make mine very easily; getting the right side of my wife's draper, I manage to get him to save all the twist reels he can spare. These are something like A; B can be represented by any piece of hard wood; hazel mine are, from a copse near me. I then stick a long nail with a brass head, through the reel and into B, and the trick is done. In setting your line stick Fig. 67 in the ground tight, and just undo sufficient to reach to a likely spot.

The tackle for the "greedy perch, bold biting fool," as Drayton very insultingly, but truly, terms the fish, is not far away different from that for pike, except that several separate hooks are usually placed on one line. There is a distinctive piece of tackle termed the "Paternoster," which I must tell my readers how to make. First, a pear-shaped lead, with a ring in the upper part, is slipped into the loop of the lower end of *a*, the gut, which is about three feet in length, and joined, as before advised, for all gut lines. So far so good. At intervals, as shown at Fig. 72, hooks on other gut or gimp—occasionally the latter if a jack be suspected near, and these are joined by loops tied at intervals in the main line, and loops tied at the ends of the gut links.

(*To be continued.*)

PRACTICAL SCENE-PAINTING FOR AMATEURS.

By H. L. BENWELL.

IV.—COLOURS (*continued*)—THE PAINTING-ROOM AND ITS FURNITURE—MAKESHIFT FOR PAINTING-ROOM—LIGHTING OF ROOM AND HEATING APPARATUS—PAINTER'S COSTUME.

IN the last chapter I described the materials with which the amateur scene-painter has to deal, and mentioned in detail the brushes that he will require, the canvas that he must obtain, and the colours that he will chiefly need. To this I will now add, before proceeding to touch on the painting-room and its furniture, a price-list of colours and materials which I think will prove both welcome and useful to the amateur scene-painter, and which has been carefully compiled for introduction here at my request by Messrs. Dale and Plant, 81, *Smallbrook Street, Birmingham*, to whom application may be made with confidence for any colours, etc., that may be required.

PRICE-LIST OF COLOURS AND MATERIALS FOR SCENE-PAINTING.

DRY COLOURS.

	per lb.		per lb.
Brunswick Greens (all shades)	-/6, -/8	Satin Red	1/6
Chrome Greens ...	-/8, 1/-	Rose Pink ...	-/5, -/6, -/8
Emerald Green	1/-	Turkey Red	-/10
Chinese Blue	4/-	Venetian Red	-/2
Brunswick Blue	1/-	Orange Red ...	-/4, -/6
Celestial Blue	-/6	Golden Ochre ...	-/2, -/4, -/6
Ultramarines	-/6, 1/-, 1/6, 2/-	Transpnt. Golden Ochre	-/6
Fine Do.	3/-, 4/-	Flake White	-/6
Cobalt Tinted Do. (superior for skies)	4/-	Carmine ... per oz.	5/-, 6/-, 8/-, 10/-
Azure Blue	3/-	Crimson Lake ...per lb.	16/-, 24/-, 32/-
Blue Verditer	-/8	Scarlet Lake	16/-, 24/-, 32/-
Refiner's Blue	2/-	Purple Lake	16/-, 24/-, 32/-
Indigo	8/-	Yellow Lake	16/-
Chromes (all shades)	-/10, 1/-, 1/3, 1/6, 2/-	Geranium Lake	6/-
		Magenta Lake	10/-
Vermilion	3/-	Violet Lake	10/-
Do. extra fine ...	4/-	Azure Lake	10/-
Chinese Red	-/9	Emerald Tinted Lake (deep and pale, each)...	10/-
Milan Red	2/-		

COLOURS GROUND IN WATER.

	per lb.		per lb.
Prussian Blue ...	2/-, 2/6, 3/-	Raw Umber	-/6
Damp Blue	-/6	Burnt Umber	-/6
Chinese Blue	3/-	Vandyke Brown... ...	-/10
Scarlet Lake	2/-		
Crimson Lake	2/-	Bronzes, all colours	8/-, 12/-, 16/-, 24/-
Carnation Paste	5/-, 6/-		
Mauve Paste	2/-	Dutch Metal (gold or silver) per doz. books	1/-
Brown Lake	4/-		
Green Lakes	4/-	Patent Size per firkin	5/-
Dutch Pink	-/6	Double Size (generally used for scene-painting) ... per firkin	3/6
Raw Sienna	-/8		
Burnt Sienna	-/10		

Purchasing Colours.—I shall now give the reader some idea as to what colours he should obtain to begin with, and also the quantity of each he should order.

Seven pounds each of flake white, Dutch pink, yellow and brown ochre, orange lead, venetian red, rose pink, brunswick greens (dark, medium, and light), drop black, German ultramarine, celestial blue, and damp lake.

Four pounds each indigo, orange chrome, yellow chrome, vermilion, and vandyke brown.

Three pounds each Prussian blue, burnt and raw siennas, burnt and raw umbers, and brown lake.

One pound each azure blue, Chinese red, crimson lake, carnation paste, mauve paste, dark and light green lakes.

Fourteen pounds of gilders' whiting, and a firkin of best double size.

The Painting-Room and its Furniture.—One of the most important considerations to be taken into account, and one which the amateur, as a rule, finds some difficulty in overcoming, is in selecting a suitable apartment wherein to execute his work. Having worked more than once under all sorts of difficulties and disadvantages, and in most out-of-the-way holes and corners, I trust no one will feel discouraged, nor allow their feelings to damp, in the matter now under consideration. I can assure one and all that by the time I have given them the benefit of my experience, they will see their way clear to set about finding a suitable apartment which they can transform into their "Scene-painting Studio."

In order to help my readers in this matter, it is my intention to immediately describe and illustrate not only the most complicated appliances used for large work, but also to afford some information on the more primitive style of apparatus, which necessity compels the scene-painter occasionally to make use of. The regular painting-room in our large theatres is in most cases situated in the "flies"—*i.e.*, over the stage; sometimes it is on a level with the stage in provincial houses; and, again, altogether removed from the theatre itself, and a shed or warehouse is made use of in some adjacent street.

In the first instance, when the scenes are painted in the "flies," the framework on which the canvas is tacked for painting is made to sink through a slot or opening in the floor of the painting-room, and is gradually wound up as the artist proceeds with his work. In cases where the painting-room is level with the stage, and sufficient depth below not allowing the frame to sink low enough, recourse is made to a kind of scaffolding, technically termed a "painting bridge," the painting frame in this instance being a fixture; these various appliances it now lies in my province to describe. Before doing so, however, I wish to call attention to Fig. 29, which is a sketch of a professional painting-room up in the "flies." The floor here is very treacherous, abounding with trap-doors, lifts, etc., for bringing up and lowering the different scenes. The painting frame will be seen on the left, with the canvas attached, and a subject "drawn in" ready for painting. The stove is also shown as used for warming the size and colours. Down the centre of the room runs a long table, containing the palettes, size cans, brushes, muller and grindstone, flogger, straight-edge, etc. At the far end of room are some shelves for storing the colours on, both damp and dry. Colours in pulp are of course in earthenware jars, and the dry colours should be put into tin canisters. Both the damp and dry colours so stored should bear labels outside the jars and tins with the name of the colour thereon. A row of gas jets are suspended down the centre of the room, and another row should be connected with some rubber tubing for making movable ground lights. These take off shadows which sometimes fall from above, and also help to dry the canvas

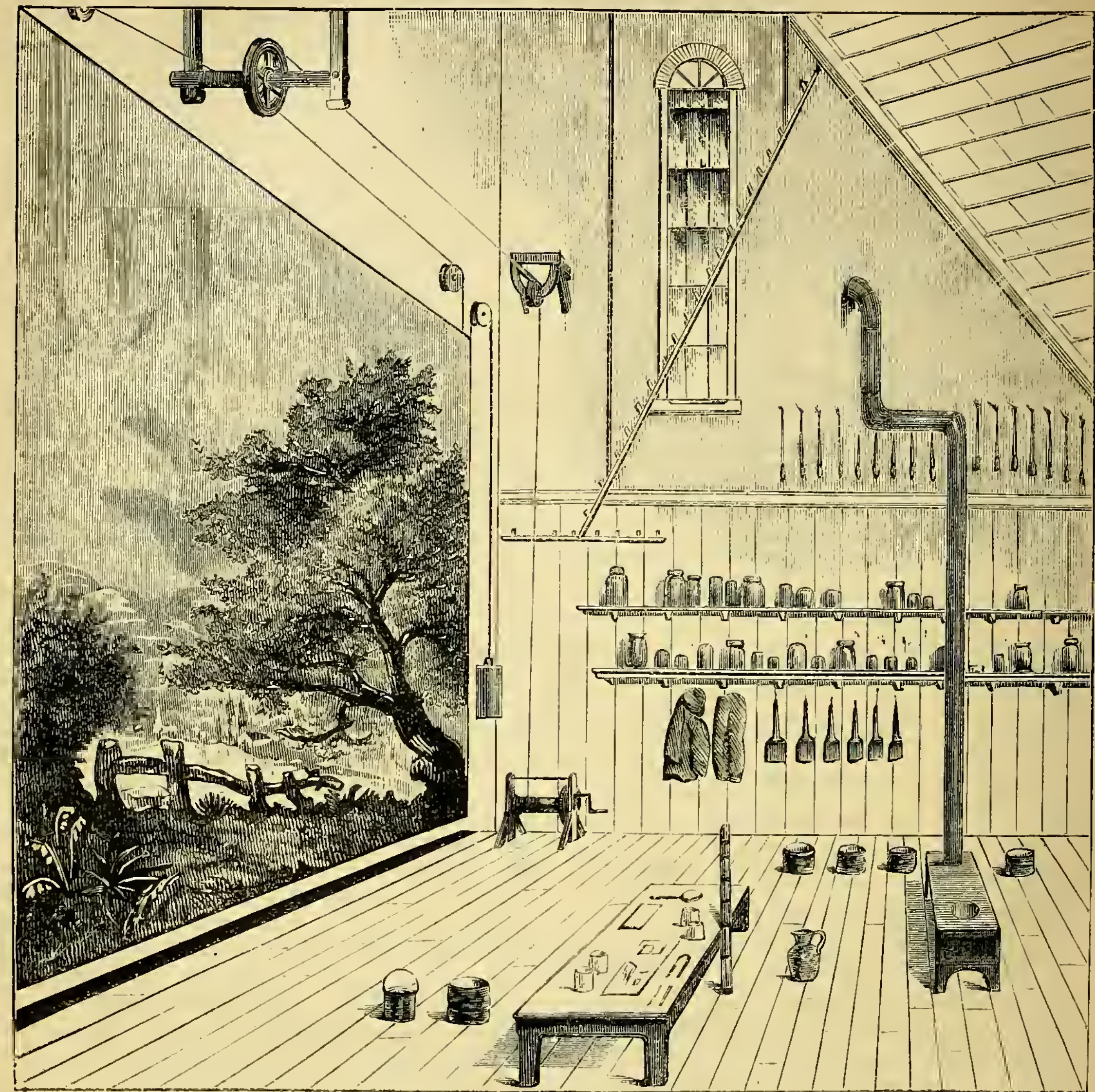


FIG. 29.—SKETCH OF PROFESSIONAL SCENE-PAINTER'S PAINTING-ROOM IN FLIES OF THEATRE.

after "priming" or "laying in." To admit plenty of light in the daytime, the room is provided with numerous skylights. A few carpenters' trestles, an old chair or two, generally complete the list of necessaries as regards furnishing; but in professional rooms may be seen portfolios containing designs, and hundreds of odds and ends too numerous to mention. I should add that the brushes when not in use should be well washed and hung on nails inserted in the wall. For the painter's personal attire a peg or two will be handy for hanging hats, overcoats, etc., upon. In large painting-rooms a labourer or attendant is always kept to wait upon the artists, wash down palettes, brushes, and grind the colours, turn the windlasses, and other odd jobs. No doubt by this time a fair idea of what a painting-room should be has been obtained by the reader.

Movable Painting Frames.—In order that the scene-painter may execute his work in a rapid and masterly manner, he should be able to reach any portion of his scene at will, and the quickest way of doing this is by having an opening in the floor as previously described. Fig. 30 is an illustration of the manner in which a large painting frame of

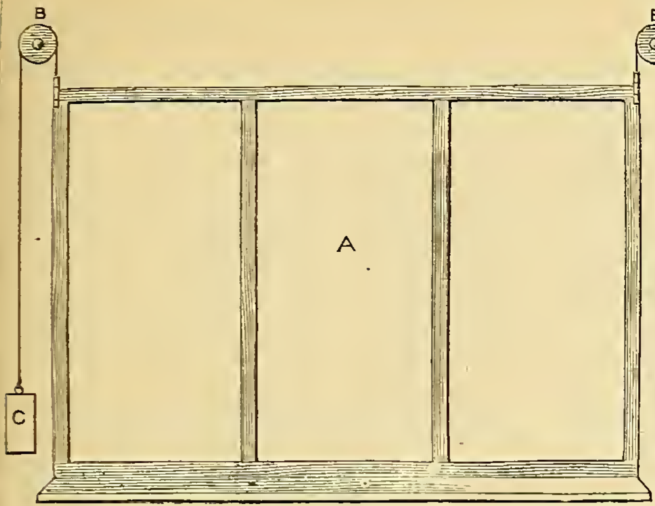


FIG. 32.—MOVABLE PAINTING FRAME FOR LIGHT WORK.

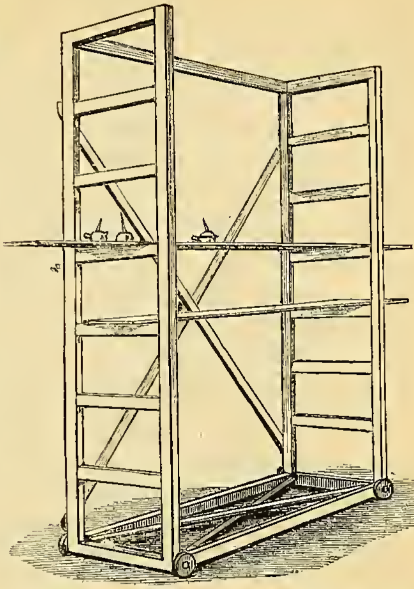


FIG. 34.—SIMPLE FORM OF PAINTING BRIDGE USED IN SCENE PAINTING.

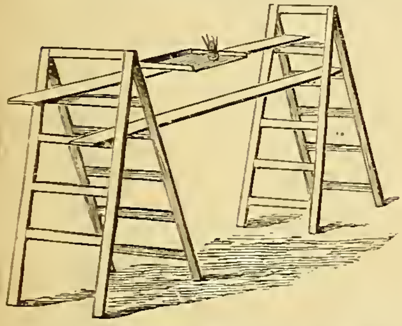


FIG. 35.—PAINTING BRIDGE OF BOARDS SUPPORTED ON TRESTLES.

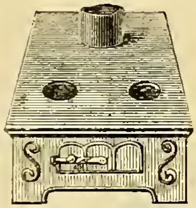


FIG. 37. — CHARCOAL STOVE FOR WARMING COLOURS, ETC.

FIG. 38. GAS STOVE.

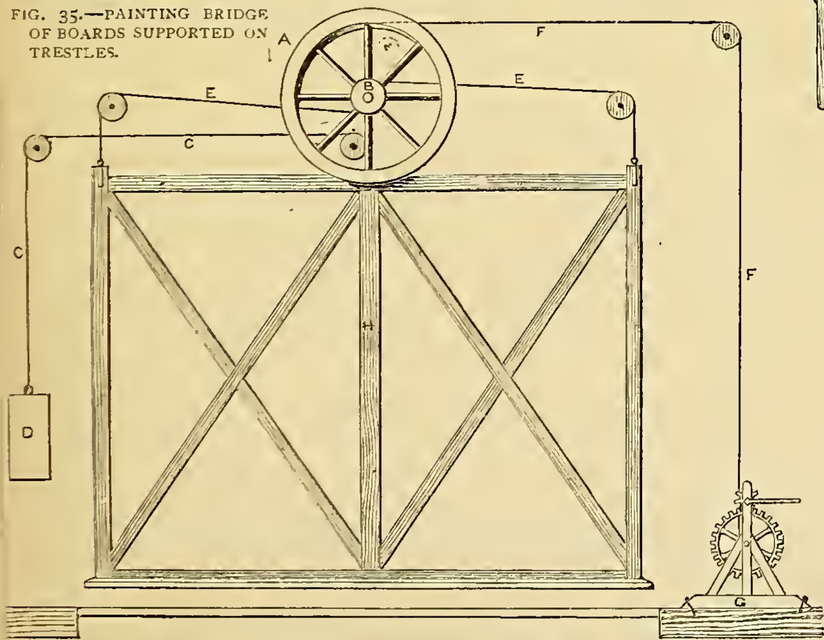


FIG. 30.—MOVABLE PAINTING FRAME WORKED WITH WINDLASS—FRONT VIEW.

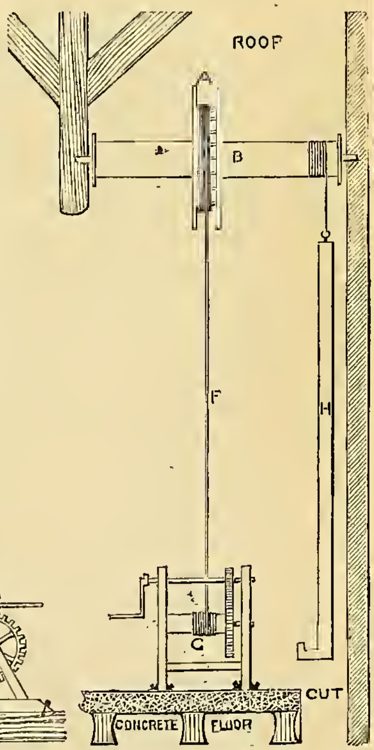


FIG. 31.—SIDE VIEW OF FIG. 30.

this description is worked. A, is the purchase wheel; B, the spindle; C, the counterweight line; D, counterweight, which balances weight of frame; E, lines attached to frame for raising and lowering it, and which wind on and off spindle or axle of purchase wheel; F, the line from purchase wheel to windlass for working the whole; G, the windlass; H, frame for canvas. Fig. 31 is a section of the same.

For smaller and lighter scenes, I give in Fig. 32 a modification of the above, which is worked by counterweights only, after the manner of a window-sash, the sketch explaining everything.

The Painting Bridge.—The drawing of this, Fig. 33,* is, I think, sufficiently plain to enable any carpenter to make one when required. A, is the platform or bridge on which the artist works; it is made to slide up and down the two pieces of framework at each end, and these are firmly fixed to the floor, their sides are made of a rectangular form, and serve as guides for the corners of the bridge to work in and keeping it from swaying to and fro when the artist is at work thereon; B, is the purchase wheel, the axle of which is let into the wall on the one side and into a beam running across the room on the other; C, C, are strong lines which support the bridge at each end, and pass over the small grooved wheels at D, to the axle at E; F, is the purchase line, and is led over the wheel, G, working in a bracket fixed to wall, down to the windlass at H. The line I I, runs from spindle down to the counterweight, which counterbalances the weight of the bridge; K, is the shelf for holding the palettes, paint pots, brushes, etc.; L, is the canvas stretched on the frame ready for painting.

The method of making a fixed painting frame is similar to the one shown in Fig. 32.

A simpler form of bridge is shown in Fig. 34. It works on wheels and can easily be moved by one person. It can be constructed to take to pieces by using coach or bed screws instead of nails. A couple of stout planks are required—one for the artist to stand on, the other to hold the palettes, colours, etc. A still more simple kind of bridge is that shown in Fig. 35, and consists of a couple of trestles or ladders, and some two inch planks. These can be hired from a house-painter in most places.

I shall now fulfil the promise I made some time since, and proceed to describe how to either extemporise a makeshift painting-room, or do without one altogether, but in doing this, I cannot give any positive instructions, for it depends entirely on the locality and also the accommodation the reader may have at his command. I must therefore rest content with throwing out a few hints and suggestions.

* Owing to want of space this cut will be given in the next Paper on this subject.

In seeking for a place to turn into a temporary painting-room, one should be selected where plenty of light can be obtained. If the artist paints by night some strong artificial light must be used.

It will be obvious to the painter, that all we require is a good solid wall, under cover, up to which the painting frame can be nailed. In towns, an old workshop, loft, stable, or other kind of outhouse, can perhaps be brought into use, or if it be in the country, a barn will meet the case, or an old lumber room at the top of the house. It is not necessary for the room to be as high as the height of the "cloth" about to be painted, as the scene can be painted piece-meal—half at a time.

I have two other dodges to describe, which sometimes have to be resorted to when the painter is hard pressed: the first is to fix his frame to the wall at the back of the stage, the other, Fig. 36, I had almost

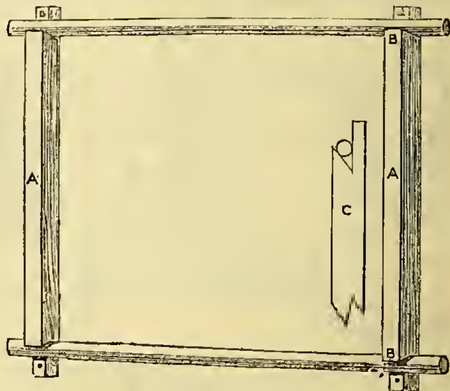


FIG. 36.—CONTRIVANCE FOR PAINTING SCENE ON ROLLERS.

forgotten. On referring to the diagram, it will be seen that the rollers to which the scenes are attached when completed, are made part of the painting frame. To explain more fully: the two uprights, A, A, are cut at top and bottom at an angle, to form a recess for the rollers to be forced into. The canvas is first tacked firmly on to the rollers, being made a little shorter than the distance between B, B. The top roller is then lifted into the sockets prepared for its reception at the top of each upright, and sufficient pressure brought to bear on the bottom roller until the canvas is stretched enough, to allow it (the roller) to be forced into the sockets at the bottom. The canvas should now be taut; and a row of tacks in each upright, driven in about half-way, will make it tighter still. The uprights should be much thicker than the rollers, as shown in section at C. If this plan be adopted great care must be exercised in squaring the "cloth" to the rollers, or the scene will be out of the perpendicular when completed. This can be avoided by the frequent use of the plumb line.

I trust that one of the above plans for making the painting frame will be found suitable in most cases, if not, perhaps a few old "flats" are at hand, and by fixing these firmly across the stage, the canvas may be tacked to them. A couple of battens will make them very secure and steady. Again, the painter may, if he likes, follow the example set by some of the American and continental artists, and tack his canvas to the floor; he would then require all the handles of his brushes lengthened, and must also have his straight-edges handled to save excessive stooping. When painting on the floor a good broad plank will be required—a little longer than the canvas, and with two blocks of wood nailed on underneath, one at each end ; this goes across the cloth for the artist to stand on, and to hold paint pots, etc., the blocks keeping the plank about two inches off the work.

I might mention that a good deal of scenery is at times painted in the hall, where the performance is to take place, and much work can be done in this way, a couple of days previous to the event coming off. To save the floor, and the temper of the hall-keeper, it is better to lay down some old pieces of sacking, no harm can then be done, if the painter keeps away from the walls: a good workman, however, makes but little mess and never allows the brushes to splash or splutter.

I need hardly add that none of the machinery I have alluded to is required in painting wings, set pieces, flats, etc., as they are nothing more or less than wooden frames in themselves, and canvased over ; sometimes on both sides.

There should be no difficulty in obtaining sufficient light in the painting-room, especially if it be a barn or outhouse where there is no plaster ceiling in the way. A few slates should be taken off, and a good piece of ribbed glass inserted in their place, it is not necessary to cut the rafters away where the glass is, as sufficient light will be obtained from between them.

A stove will be required for warming the size and colours, and making them fit to work with. Stoves can be had suitable for this, which burn either coal, gas or oil. Fig. 37 is the usual thing used by professionals, as the hot plate will hold plenty of pots and cans. A good form of gas stove is shown at Fig. 38, but it only heats one vessel at a time.

The last item I have to mention is the personal outfit of the painter: this consists of tunic with a pleated skirt and waistband or belt. It should be made to button close round the wrists. A loose pair of overalls must also be made, easy to slip on and off, and a pair of canvas shoes should be worn. The tunic and overalls may be made out of the canvas used for the scenes, and are, indeed, generally made from "remnant" lengths. The amateur scene-painter, however, will not require a painting dress of such strong and durable material. The chief object in view is to avoid spattering and staining cloth clothes with stray splashes of paint, and a holland blouse of some length, such as is worn by house painters and decorators in London, will be found sufficient. The length, perhaps, is objectionable to a certain extent, as the scene-painter has to move from place to place more speedily and frequently than house painters, so for the blouse may be substituted a tunic and overalls of holland, or even coarse unbleached calico.

A covering for the head should always be provided, and for this I prefer a light cork helmet. The one at present in my possession is an old cast-off regimental, which has done me service in many ways when out volunteering. It was once black, but is now white, for it was once—unknowing to me—whitewashed all over, in order to form the head-gear for the statue character in "Hercules, King of Clubs," a racy and laughable farce, and one well suited for amateur performance.

(*To be continued.*)

AN ECCENTRIC CHUCK FOR AMATEUR TURNERS.

By R. LEWIS.

AMATEUR turners who desire to become possessed of an eccentric chuck, by whose aid they may be enabled to execute various patterns in ornamental turning, will find in Figs. 1, 2, 3, 4, that are given in illustration of this paper, designs for a chuck of this description, which may be easily made, and which, when made, will prove a most useful adjunct to any lathe for the purpose already mentioned. The construction is clearly set forth in the diagrams that have been named, and in these, for convenience' sake, the various parts are similarly lettered so that the following description refers equally to them all.

In these diagrams, then, A represents the ordinary face-plate, into one of the slots of which is fitted a block, B, moving freely but not loosely therein ; this block has a projecting arm, one end of which is turned up to receive a screw for holding the eccentric chuck, C, in position. The block has a circular hole drilled in it, through which one portion of the chuck pin passes, and is fastened by the nut, E ; at the other end is a taper screw for holding the work or the chuck to which it is attached.

The eccentric chuck, C, has a square hole in the centre, into which the upper part of the pin, D, fits, and is thus prevented turning upon it, although the lower part, which is circular, is free to revolve in the block, B, and when both are attached to the face-plate can be retained in position by the nut, E. The block, B, must

be somewhat less in thickness than the face-plate, so that there may be a slight space between it and the washer resting on the back of the face-plate to allow of tightening.

it will answer the same purpose, provided that there is sufficient surface for any work or chuck that may be fixed on the screw to bear against—in fact, this part of the arrangement acts principally the part of a divi-

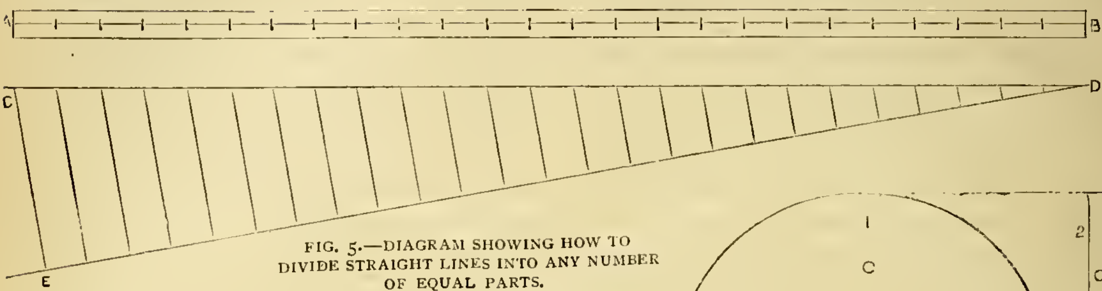


FIG. 5.—DIAGRAM SHOWING HOW TO DIVIDE STRAIGHT LINES INTO ANY NUMBER OF EQUAL PARTS.

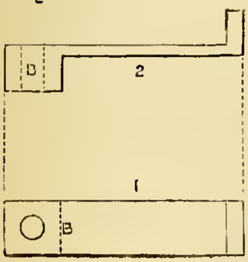


FIG. 4.—BLOCK FOR ECCENTRIC CHUCK. 1, Plan. 2, Section.

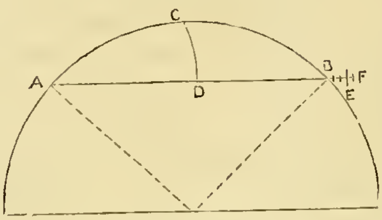


FIG. 6.—DIAGRAM SHOWING HOW TO DIVIDE CIRCLES.

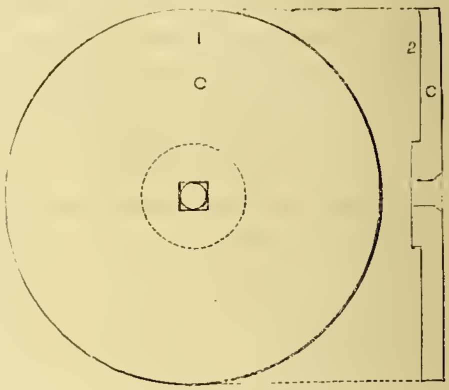


FIG. 3.—ECCENTRIC CHUCK. 1, Plan. 2, Section.

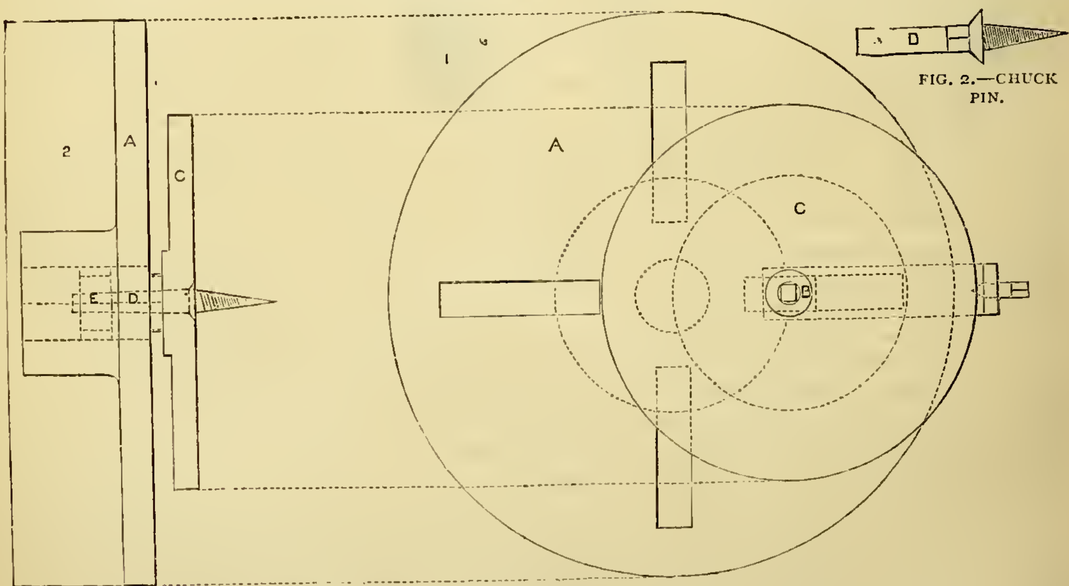


FIG. 2.—CHUCK PIN.

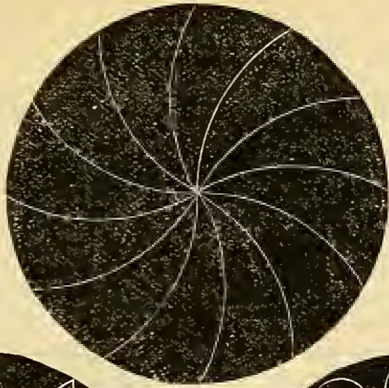
FIG. 1.—FACE-PLATE AND ECCENTRIC CHUCK. 1, Plan. 2, Section.

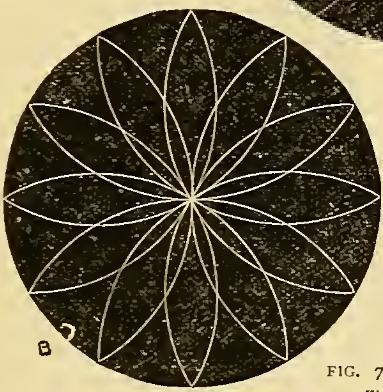
The chuck may be of wood or metal, but its edge should be of some material sufficiently hard to preserve the divisions from damage ; this may be done by putting on a metal ring, or if the amateur can meet with a spur wheel with the number of teeth or divisions to suit his purpose, and fit it accurately to the pin, D,

sion plate. In making the eccentric chuck care must be taken by the maker, whether amateur or professional, that when the block, B, butts against the outer extremity of the slot, or is as far from the centre as it will go, that the head of the set screw clears the bed, and the elbow carrying the screw should be as near the chuck

as convenient, so that the screw may be as short and free from vibration as possible—thus, if the plate be 6 inches in diameter the radius will be 3 inches, and, allowing $1\frac{1}{2}$ inches for the projection of the eccentric chuck, when it is out to its fullest extent, this will leave a space of $\frac{1}{2}$ inch for clearance (the lathe being 5 inch centre).

When making the set screw it will be as well to obtain beforehand a clock key, gun-nipple wrench, or any contrivance to which to fit the square head, so that it may be used for turning it when inserting it into or withdrawing it from the holes in the division plate. Dividing the division plate may seem to be a difficult job, but it may be easily done in the manner shown in Fig. 5; but, of course, if the amateur has provided himself with a spur wheel he need not take the trouble. Take a strip of paper the width of the edge of the chuck, and of sufficient length to go *exactly* round it at A B; draw a line along its centre, then to divide this line into any number of equal parts. Lay off a line, C D, of the same length as the line, A B, or in other words of the same length as the circumference of the chucks, and from the point D, draw another line, D E, at any angle to C D. On this line mark


A


B

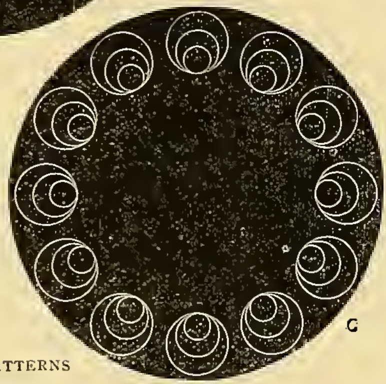
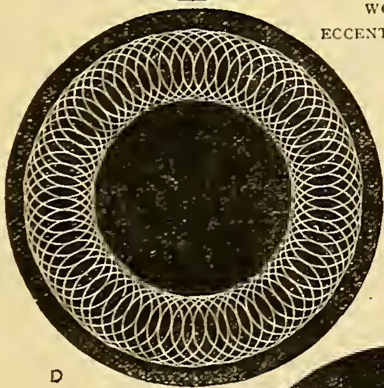
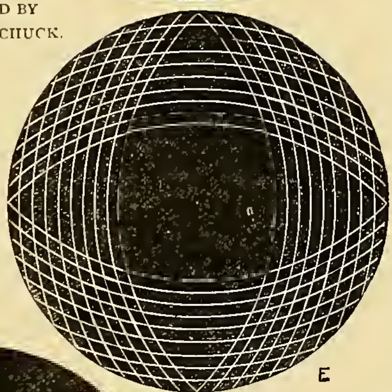

C

FIG. 7.—PATTERNS WORKED BY ECCENTRIC CHUCK.


D


E

F


SECTION

off a number of equal distances of convenient lengths corresponding to the number of divisions required; then supposing E to indicate the furthest point of the last of the distances required, draw a line from E to C and proceed to rule lines parallel to this, each line starting from a point on E D, then the points of intersection of these parallel lines with the line A B will mark off the same number of equal distances on that line; paste or glue the paper round the circumference, and through these points drill holes for the reception of the end of the set screw. In the example I have taken, twenty-five, that being as awkward a number as could be well fixed on, but the same rule applies to any number of divisions. In pasting the paper round the edge, the moisture of the paste will cause the paper to expand. I have called attention to this so that the operator may not think the paper too long, and try to alter it; when it is dry it will be found to be properly and smoothly stretched and of the right length.

While on this subject, we may as well show by means of Fig. 6, a method of dividing the face of the plate—Describe the circle and divide it into quadrants (although any other division less than a semicircle

will do), then lay off this arc A C B, on the chord A B, and bisect it in C; with one point of the compasses at A, and with the radius A C describe the arc C D, and from D set off on the chord A B, produced beyond B, the straight line D E, equal to A D. Now divide the distance E B into three equal parts, and add one of them to the straight line A E; then the line A F will be equal to the length of the arc A C B. Divide this line (as already shown) into the required number of parts, and mark them off on each quadrant. There will be a slight difference, as each distance in the compasses will be the chord of the arc and not the *length of the arc itself*, but the difference will be so small, that it can be easily adjusted.

Having done this, let us now proceed to put the machine into action, for the production, we will suppose, of A, in Fig. 7. Adjust the centres of A and C so that they are 1 inch apart, and fix the work on C, cause it to turn against the tool for a portion of a revolution (this should be done by hand as a revolution is not completed); loosen the nut E, and shift the chuck one or more divisions (in this case the circle is divided into twelve), fix the set screw, tighten E, and proceed as before: repeat this till all the curves are traced.

The pattern B in Fig. 7 is done in the same way, but as the circle is completed the motion may be given by the foot. For the pattern, C, set the centres $\frac{3}{4}$ inch apart, and describe as many of the small circles as you wish—then shift the centres $\frac{1}{16}$ inch, that is, to $\frac{3}{4}$ and $\frac{1}{16}$ inch, and repeat the operation, which will give the second-sized circle, the tool of course being held to agree with its diameter, which if it touches the circumference of the other will be $\frac{1}{8}$ inch greater diameter, shift another $\frac{1}{16}$ inch, and the touching circle will be $\frac{1}{4}$ inch larger. For the pattern D the centres are set $\frac{3}{4}$ inch apart, and of course a more finely divided division plate used to allow of so many circles being made. For the pattern, E, the centres must be 1 inch apart, and only four divisions used. The pattern, F, has its centres $1\frac{5}{8}$ inch apart, but in order to so form this pattern, the face of the work must be more or less coned, and some care will be required to make the junction of the lines correspond. This difficulty may be partly overcome by making a tool with a serrated edge like a screw tool; you can then cut several circles at one time, and will consequently want fewer adjustments.

I may conclude this paper by pointing out that an almost endless variety of designs can be made, depending on the ingenuity of the amateur turner, and that these designs will in many cases suggest themselves as he becomes more and more familiar through practice with the action and use of the eccentric chuck that I have described.

NOTES ON NOVELTIES.

By THE EDITOR.

20. THE ENGINEERS', MILLWRIGHTS', AND MACHINISTS' PRACTICAL ASSISTANT. 21. METROPOLITAN PUBLIC GARDEN ASSOCIATION. 22. THE PHONETIC JOURNAL. 23. THE JOURNAL OF MICROSCOPY AND NATURAL SCIENCE. 24. WORMELL'S "ELECTRICAL UNITS." 25. MELHUISH'S "FRET SAWING IN FANCY WOODS AND METAL." 26. WAUDE'S PATENTED KNOCKER-BELL. 27. SELF-ADJUSTING WATCH KEY. 28. TOOL-HOLDER FOR GRINDING. 29. SYER'S AMATEURS' CRAMP. 30. THE PATENT PERPETUAL RUSSIAN STOVE.

20. THE ENGINEERS', MILLWRIGHTS', AND MACHINISTS' PRACTICAL ASSISTANT.—There must be, I think, but very few who cannot pick up some crumbs of information to assimilate at leisure, for their own use, from "The Engineers', Millwrights', and Machinists' Practical Assistant," by Mr. William Templeton, which has now reached its seventh edition, and which is published by Messrs. Crosby Lockwood and Co., 7, *Stationers' Hall Court, Ludgate Hill, E.C.*, and sold for 2s. 6d. But, if generally useful to the many, it will be especially serviceable as a *vade mecum* to the more restricted number of amateurs, who take to screw-cutting, and the construction of toothed wheels and machinery. With regard to the book itself, it is neatly bound in cloth, measures $5\frac{5}{8}$in. by $3\frac{3}{4}$in., and contains 108 pages of printed matter, two engraved plates, of which one gives proportions for the construction of toothed wheels, and the other some useful scales of feet and inches, and several ruled pages for jotting down memoranda bearing on the subject matter contained in the volume. The contents are of a miscellaneous character, and consist chiefly of tabular matter, and calculations specially required by engineers, millwrights, and mechanics. Among the most useful I may name those relating to the comparison of French and English measures, and the conversion of equivalents in each, the use of the slide rule, the tables of specific gravities, examples of decimal equivalents, the rules for change wheels, and the rules for and tables of circumferences and areas of circles.

21. *The Metropolitan Public Garden, Boulevard, and Play Ground Association.*—The second annual report of this useful Association, which is in immediate connection with the National Health Society, and has its offices at 83, *Lancaster Gate, W.*, under the able presidency of Lord Brabazon, gives an interesting account of the work that has been done by the Association since its institution, and a list of members, with subscriptions and donations already given. It gives a digest of the "Metropolitan Open Spaces Act," 1881, and an exhaustive and useful table of trees, shrubs, evergreens, and climbing plants that will live in London, and are therefore suitable for the Metropolis and the surrounding suburban districts. The price of the Report is 3d.

22. *The Phonetic Journal.*—This serial publication has entered on its forty-fourth volume, and, I presume, the forty-fourth year of its existence. That it is the leading paper of its kind there can be no doubt, and its long existence speaks

volumes for the perseverance and persistence of Mr. Isaac Pitman, the inventor of phonography, a "pegging-away"—to borrow one of Abraham Lincoln's pet and pertinent phrases—which everyone who has a hobby would do well to imitate. Personally I do not care for phonography, and think that it has as little chance of general adoption as "travelling per kite;" and, unfortunately, I can neither read nor write shorthand, a deficiency in my acquirements that I regret daily. No man's education, be it what it may, for business and the professions, can be considered complete without a knowledge of shorthand, and from what I hear from those who are acquainted with it, there can be but little doubt that Pitman's system is superior to all others. Of course, the back-bone and mainspring of the system is the writing down of words as they sound; and when I say that I do not care for phonography, it must be understood that I do not care for or in any way advocate the change of the present mode of spelling and writing English for Mr. Pitman's Phonetic System.

23. *The Journal of Microscopy and Natural Science.*—This handsomely-printed and well-got-up quarterly is the Journal of the Postal Microscopic Society. It is a demy 8vo, containing 64 pages, and eight lithographed plates, and is published by Messrs. Baillière, Tindall, and Cox, *King William Street*, *Strand*, *London*, *W.C.*, at 1s. 6d. As its title implies, it deals chiefly, if not exclusively, with microscopic science. "The Microscope, and How to Use It," and "Half-an-hour at the Microscope with Mr. Tuffen West," are, perhaps, the portions of the Part (Part 13, vol. iv., Jan., 1885) that will be found to be most generally interesting. For the benefit of my readers I make the following extract from "Current Notes and Memoranda":—

"CEMENT FOR GLASS, PORCELAIN, ETC.—Take soft cheese, grind and wash it in hot water, then, when it is freed from all soft matter, and nothing remains but fine caseine, press it in a fine cloth so as to squeeze out all the liquid. There remains a white matter, which is to be dried, reduced to powder, and preserved in a wide-mouthed bottle, or well-fitting box. To make use of it, it must be ground up with a small quantity of water, which makes a very adhesive paste. It must be used immediately, and in the cold. This cement sets rapidly, when once dry it cannot be re-dissolved, either by moisture or heat."—*Moniteur des Produits Chemiques.*

"The above is extracted from the 'Chemical Review,' to which the editor adds:—'According to our experience, the dry caseine should be ground up, not in water, but in ammonia, solution of borax, or in lime water. We prefer to obtain the caseine, not from cheese, but from butter-milk, which is precipitated with acetic acid, using as little as possible. The precipitate is repeatedly stirred up in hot water, and thus washed by decantation until all the fatty matter is removed. It may then be dried and pressed as above.' If this cement cannot be re-dissolved either by moisture or heat, we think it will make a splendidly firm cement for affixing glass or metal cells to glass slips, at any rate, it is worth a trial."

24. *Wormell's "Electrical Units."*—This pamphlet of 48 pages crown 8vo, whose full title is "Electrical Units: Their Relation to One Another, and Other Physical Units, with a Chapter on the different Forms of Dynamos, and a Series of Numerical Questions," is an appendix to "Magnetism and Electricity," by Dr. R. Wormell, M.A., a volume of the "Science and Art Series," published by Mr. Thomas Murby, 3, *Ludgate Circus Buildings*, *E.C.* The price of the volume just named is 3s., and that of the appendix now under consideration is 1s. It gives at the commencement a remarkably clear and intelligible Table of Measures, including a Conversion Table, which takes the place usually occupied by the title page, and then proceeds to deal, in Part I., with Electrical Units and their various systems, and in Part II. with Measurements applied to Lights and Motors, in which is given a description of some of the most important incandescent lamps and dynamo-electric machines. All who are interested in electric lighting and electro motors, will do well to place on their shelves both "Magnetism and Electricity," and its appendix, "Electrical Units."

25. *Melhuish's "Fret Sawing in Fancy Woods and Metals."*—This is a very useful catalogue of tools and appliances used in fret sawing, wood carving, etc., and a variety of miscellaneous articles useful to amateurs, prepared and sent out by Messrs. R. Melhuish and Sons, 85 and 87, *Fetter Lane*, *London*, *E.C.*, to whom a bronze medal was awarded at the close of the Health Exhibition of 1884, for excellence in tools, Messrs. R. Melhuish and Sons having had an exhibit of tools and machinery occupying considerable space in the "Technical Schools" department. The catalogue is rendered more attractive than pamphlets of this kind usually are by brief illustrated papers comprising instructions and lessons in the arts of fret sawing in various substances, and carving in wood, which are thoroughly practical, and contain the pith and essence of the subject in comparatively few words. It is a catalogue from which every amateur, I think, may gain some useful information relative to numerous handy tools, and the processes already mentioned.

26. *Waude's Patented Knocker-Bell.*—Messrs. R. Melhuish and Sons send me a specimen of this ingenious and useful contrivance, in which a knocker and a bell are combined, and which does away with the necessity of having a bell as well as a knocker at the front door—a desideratum when it is remembered how frequently ordinary door-bells are put out of order by the assaults of reckless errand-boys. The knocker itself is lighter and smaller than the general run of articles of this class, and more artistic in design. It is bronzed, and is attached to the door in the usual way by a bolt at top and another at the bottom, which pass through the door, and carry nuts which are screwed up to the inner surface of the door to hold the knocker firmly. So far the knocker resembles all other knockers. Its difference lies in the lower bolt, which is nearly $\frac{1}{2}$ inch in diameter and about $4\frac{1}{2}$ inches in length, and is hollow, and in this bolt is a loose pin, whose purpose will be seen presently. On the inner end of the bolt is carried a gong, $3\frac{1}{2}$ inches in diameter, and without the gong is a small piece of metal, which serves as a carrier for a hammer to strike the gong. When the knocker is raised the hammer falls by its own weight, and the upper end presses against the inner end of the pin and thrusts it forward so that the outer end projects about $\frac{3}{16}$ in. beyond the face of the part on which the knocker strikes. When the

knocker is brought down on the plate, the pin presses against the hammer and causes it to strike the gong. The cost of the knocker-bell is, I believe, 4s.

27. *Self-Adjusting Watch-Key.*—Who is there who at some time or other has not lost his watch-key, or left it at home, or had an appeal made to him for the loan of a watch-key by a friend in a similar predicament? Watch-keys may be included among those things which it is considered unwise and imprudent to lend. The spills of watches differ in size, and each must have a key accurately fitted to it, and to attempt to wind up a watch with a key that is not its own is generally bad for the watch or for the key. I was asked by a friend to lend him mine the other day, and as the spill of his watch was too large for my key, the pipe of the key got split through forcing it on the spill, and was for ever after useless to me, and I had to buy another. However, any difficulty of this kind may be obviated, and one's desire to be obliging in the matter of lending a watch-key may be satisfied, by the possession of one of the Patent Self-Adjusting Watch-Keys represented in Fig. 1, that are designed to wind any key-winding watch. The handle of this handy key is of ebony: they are sold at 1s. 3d. and 1s. 6d. each. I take the following description of the key from the catalogue to which I have referred above. "By pressing the push pin at the top of the key, the jaws expand wide enough to admit the winding square of the watch, which it firmly holds during the process of winding. When the jaws of the key have once seized the winding square of a watch, it cannot by any chance slip off, or wear round the angles of the post. When the winding is complete, the winding square is released by a simple pressure of the push pin. The key is absolutely proof against the danger of conveying dust to the movement. By springing the jaws open all accumulations in the pipe or jaws of the key are at once expelled." A Universal Clock Key is made on the same principle, but in a different form, having a broader head, like a thumbscrew, so that the operator may obtain the necessary purchase in winding up any clock. It is sold, nickel plated, at 3s. 6d.

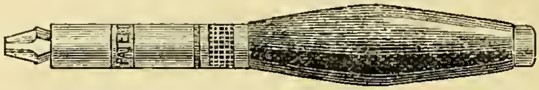


FIG. 1.—PATENT UNIVERSAL SELF-ADJUSTING WATCH-KEY.

28. *Tool-Holder for Grinding.*—Those who grind their own tools will find this tool-holder a very serviceable appliance for this purpose. It is composed of two parts, connected and hinged together by a pin, as may be seen by reference to Fig. 2. Connected with the broad end of the fore-plate is a strong metal bridge, whose ends are turned under the plate, and fixed to it by screws. The tool to be ground is inserted in the opening between the plate and the top bar of the bridge, through which passes a thumbscrew, by which the tool, whether chisel or plane iron, is held tight. The lower edge of the front of the fore-plate is bevelled. The hind-plate is longer than the fore-plate, and carries in flanges projecting from the under surface at the lower end a small cylinder of metal. Near the junction of the plates there is, in the fore-plate, a projection, in which is set a bar passing through another smaller cylinder attached to the lower part of the hinder plate. This bar is cut in the form of a screw at its lower extremity, and for about half way up the bar, and on the screw works a circular milled nut. By means of this contrivance the ends of the connected plates may be drawn closer together, or pushed further apart, so that the tool-holder may be suited to any grindstone, whatever may be its radius and the curvature of its circumference. A coiled wire passed round the bar keeps the little cylinder through which it passes firmly pressed against the milled nut, and prevents the closer approach of the two parts of the tool-holder which are thus held apart, unless sufficient pressure is applied to overcome the resistance of the spring. This useful appliance has been sent to me by Messrs. R. Melhuish and Sons, 85 and 87, *Fetter Lane, E.C.*, who tell me that its price is 5s. It will be noticed that the illustration differs slightly from the description given above, but, possibly, the specimen sent to me is an improvement on the original form. If purchasers of this tool-holder should find that the bevel of the edge of the fore part, and the large cylinder attached to the hind part, are not in the same plane, care must be taken to bring the edge of the tool that is being ground in the same plane with the surface of the cylinder, for, if otherwise, the result of the grinding will be anything but satisfactory, as may be supposed.

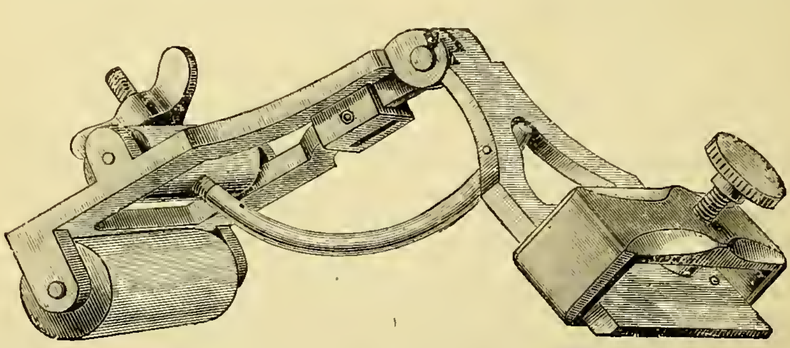


FIG. 2.—NEW TOOL-HOLDER—ADJUSTABLE TO ANY GRINDSTONE.

29. *Syer's Amateurs' Cramp.*—Mr. Thomas J. Syer, of the "Finsbury School of Amateur Mechanics," *Finsbury Buildings, Finsbury Square, E.C.*, and of 1, *Finsbury Street, Chiswell Street, E.C.*, has recently introduced a new patent cramp for amateurs, which, for various reasons, is well calculated to meet their requirements better than the ordinary iron cramp. Foremost among these reasons is the fact that they are made with steel bars and wedge racks; this renders them lighter in weight than those with wrought-

iron bars, while they are more reliable than these, because, by virtue of their construction, a sure and certain grip is obtained on any article that may be placed within their jaws when the cramp is screwed up. An illustration of this new cramp is given in Fig. 3. They are made in various sizes up to 6 ft., and lengthening bars are supplied for them. The smaller sizes have flat bars. The most useful sizes for amateurs are the 2ft. 6in. cramp, with flat bar, sold at 8s. 6d., or the 3ft. 6in. cramp, with T bar, price 17s. 6d.

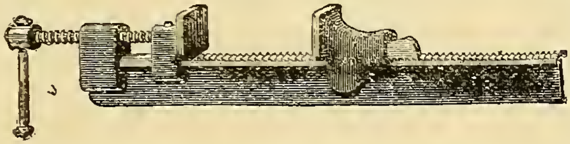


FIG. 3.—SYER'S NEW PATENT CRAMP FOR AMATEURS.

30. *The Patent Perpetual Russian Stove.*—The following query has been addressed to me by a correspondent, "Do you know anything of the Russian Perpetual Stove?" and he continues, "Perhaps it might find a place among the 'Novelties,' and suit some of our friends who want to warm their greenhouses." I have much pleasure in giving the result of my inquiries for the information of my readers generally, and the correspondent to whom I have alluded in particular; but as I have not had an opportunity of testing either of the stoves that are supplied under this name, it must be understood that I do not recommend them from *personal* experience, although they seem desirable for heating purposes for rooms and halls in private houses, churches, and public buildings generally; and as the products of combustion are carried off by a pipe into the open air, I do not see why they should not be of service in small greenhouses and conservatories also, though there is but one method of warming these structures that is attended with perfect and absolute safety and security from harm, and that is heating by means of hot-water pipes. Illustrations of the "Czar" and the "St. Petersburg," of which the prices respectively are £3 15s. and £2 10s. nett, are given in Figs. 4 and 5. They are supplied only by Messrs. Robt. Duncan & Co., 121, *Oxford St., London, W.* They do not consume their own smoke, but this has a means of escape by way of the outlet at the back, to which a sufficient length of piping can be attached to carry it into any chimney or flue, or through an opening in wall or window, by means of which the piping can be carried into the open air, and in an upward direction to any necessary height.

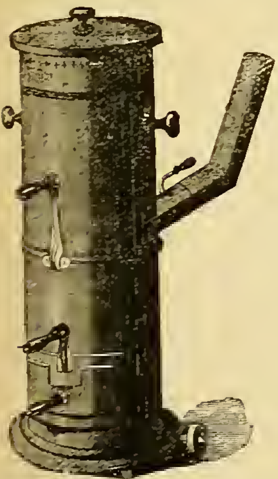


FIG. 4.—THE "CZAR."

The "Czar" stove is made of polished sheet iron, with metal ornaments and polished black top. It is about 40 inches in height and 14 inches in diameter. Being placed on wheels, which can be removed when the stove is fixed in position, it can be easily removed from place to place, or from room to room. It is so constructed that effectual ventilation of the entire space in which it stands is always secured, and by means of an appliance with which it is fitted, it is possible to adapt the heat given forth so as to suit a small space as well as a large space, the limits named being 3000 cubic feet as a minimum, and 15,000 cubic feet as a maximum. Provision is made under the lid for warming plates, or for generating a moist temperature, which is necessary for plant growth. However great the heat given forth may be, the lower part of the stove always remains cool, and thus there is no risk of damage accruing to floor or carpet, or any substance on which the stove may be placed. No workman is required to fix it; it has only to be placed in proximity to a chimney or flue, into which the iron smoke-pipe, supplied with the stove, must be introduced. Its radiation is perfect, and all parts of any room in which it is placed are equally warmed. About 20lbs. of dry non-bituminous coal, that is to say, anthracite or Welsh coal, are sufficient for 24 hours, costing, at London retail prices, about 3d. Coke may be used at less expense. When once lighted, the stove requires no attention for 12 or 15 hours. If coal is used, it must be replenished once in 24 hours, if coke, once in 12 hours.

The "St. Petersburg," like the "Czar," can be used in places where it can be brought into communication with a chimney or flue, but it is equally available in any room or space where no flue exists, as long as its smoke-pipe is carried into the open air by an outlet made in wall, roof, or window. It is made of the same material as the large stove, and is about 36in. high and 13in. in diameter. When charged with about 14lbs. of dry non-bituminous coal, or with coke, it is lighted by placing some live fuel on the top, the fire quickly spreading through the coal or coke below. When once alight it requires no attention for 8 or 10 hours, but if allowed to go out, the residue within it has not to be taken out before refilling and relighting, thus obviating any spread of dust, an evil which is unavoidable with other kinds of stoves in which coal is burnt, and with open grates. The fire can be extinguished gradually whenever it is desired to do so. These stoves are called "perpetual," because they may be kept alight day after day, and night after night, by the addition of coal, in the "Czar," once in 24 hours, or coke, once in 12 hours; and in the "St. Petersburg," with coal once in 12 hours, or coke, once in about 8 hours. They appear to be well worth the attention of all who require heating apparatus of this description.

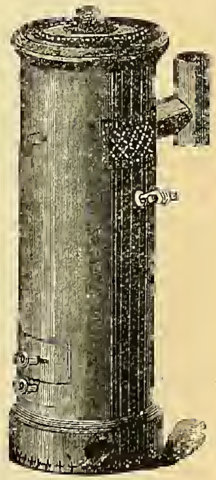


FIG. 5.—THE "ST. PETERSBURG."

AMATEURS IN COUNCIL.

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine, the information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

Music Printing Outfit.

*** Many readers of AMATEUR WORK have made inquiries from time to time for means of printing music—either by type or engraved plates, or by some handy multiplying process, similar to graph—and Blue Process Printing. Being struck by Notice No. 264 in the Sale, Purchase, and Exchange Department, I wrote to the advertiser *pro bono pub.* to ask him where outfits such as the one he offers can be procured. His reply is given below. I will forward his address to any one who desires to have it, on receipt of a stamped and addressed envelope. It must be understood that I know nothing about these outfits, and those who buy them must do so on their own responsibility. "I received your note this evening, and am happy to inform you that I can supply any number of Music Printing Outfits, as described in my advertisement. But the one advertised for 10s. is one which I have had in use for some time. The price of a *New* 'Outfit' is 15s. 6d."

Combination Saw Stand.

OLLA PODRIDA comments on GRAHAM'S reply, as follows:—GRAHAM may spare regret that his "meaning should have been hidden from me." It has caused me no inconvenience. It would have been very difficult to conclude that he *had* a "meaning." If so, it was "hidden" much too deep for amateurs. His regret should be expended for those who do not own the knowledge of which GRAHAM conceives himself to be the fortunate possessor. I should be sorry were I compelled to consult the library for information to enable me to drill a common washer. GRAHAM talks as if the hole to be drilled were six or eight diameters long. It is "*absurd nonsense*" to recommend that a washer, *three-eighths of an inch* thick, should be drilled from *both* sides. I suppose that he would treat sheet-iron drilling in a similar fashion. The cases are practically analogous.

As to turning and facing this poor abused washer, let me tell him that, unless the thing is chucked, bored, and one side faced in the lathe, the simplest, best, and truest way is to face both sides on a mandrel at *one* operation. The mandrel may be carried between the centres or held in a "pod," or drill-chuck, at convenience. This will also be obvious to a practical mind or amateur of moderate calibre, without recourse to the "standard works" which GRAHAM apparently considers irresistible and infallible. Why did he not mention and illustrate the use of the centre square in page 470, Vol. III.? and why did he not also there explain that if a hole *must* be drilled from both sides of a piece of work, a smaller drill should be used first, and followed by a "broach," "rosebit," or *special* drill to finished size? In addition to being told that a certain thing has to be done, the amateur requires full information as to *how* it is to be done, and that too in the simplest way. This is an important point which GRAHAM entirely ignores. That is not the way to remove the "rocks ahead" and "pitfalls" of which he speaks in such lofty strains. GRAHAM should be much less pedantic on such sorry ground. It would also benefit him to cultivate a little practical knowledge before assuming Mentorship. I have many reasons for coming to such a conclusion. One of those reasons is illustrated in the Supplement to his article away back in Vol. II., page 491, in which the crank figured by him is as utter a piece of "*absurd nonsense*" as has been my lot to witness. No practical man, in his sober senses, would dream of presenting such an abortion of a common, well-known simple detail.

Instructions in Gilding.

C. C. B. (*Northampton*).—Instructions in gilding were completed in the second paper on this subject, entitled, "The Art and Mystery of Gilding," given in Part 27 of this magazine. Your second query has been remitted to the proper quarter, as requested.

Correspondence re Sales and Exchanges.

C. W. writes:—"I venture to suggest as a desirable addition to the instructions at the head of Sale column, viz., that 'If a reply is desired, a stamped and directed envelope must be enclosed;' or that 'Silence is to be taken as refusal.' Only one of the six correspondents whose answers to my offer (No. 213) you have forwarded enclosed a stamp, and in the case of a small amount it is really too much to expect a seller to provide postages for replies. I once offered (in the Bazaar Exchange and Mart) a 3s. 9d. book for 2s., and no less than five people sent P.O.'s, and no stamps; altogether, I spent 9d. in postages on that book. It may seem ungracious to grumble at having to answer offers (and, by the way, I must congratulate you on the success your Magazine must have obtained, and the demand that there must be for 'Every Man His Own Mechanic,' for one offer to have brought so many answers); but you will, I am sure, see that annoyance and a tax on all advertisers would be avoided by some such intimation as I have suggested." [On reference to the heading to the "Sale, Purchase, and Exchange" Department, you will see that I have accepted your suggestion. It is only fair that those who write for information with regard to any article advertised in this part of the Magazine, and wish to know the fate of their application, should enclose a stamped and directed envelope for reply. At the same time advertisers should bear in mind that the insertion of their notice costs them nothing, and that the expenditure of a few postage stamps in acknowledging applications cannot be considered a very heavy tax on the success which has attended the publication of any particular notice.—ED.]

Cement to Resist Bi-sulphide of Carbon.

F. W. G. (*Tunbridge Wells*).—Try this: Pulverised glass, 2 parts; litharge, 1 part; made into a paste with liquid silicate of soda.

Storage Batteries.

FESTINA LENTE.—I hope to deal with the subject of Storage Batteries at some future time; but when, it is impossible to state definitely. The Editor's drawer is crammed with papers demanding prior attention, and my list of engagements, apart from this, is a very long one.—G. E.

Wood for Rod-Making.

DELTA.—I will describe the chief and best woods for rod-making when I arrive at that part of the subject in my papers on "Fishing Tackle: Its Material and Manufacture." At this moment I do not recognize the wood you mention, "called Dagame, grown in the island of Cuba, said to be better than lancewood, greenheart, or any other for fishing-rod construction." It is certainly not common, and if it be superior to greenheart, it must be good indeed.

Fastening Hooks and Eyes on Gut Lathe Bands.

IAGO CYBI writes:—"The hook and eye should be as nearly as possible of the same size as the gut, which should be pared down just enough to enter with difficulty. Then see that your screw threads are clear; take the hook or eye in one pair of pliers, and the gut in another, and screw it in very tight, and so far, that the gut comes through a little into the inside of the hook or eye. Next heat a bit of small wire nearly red hot, and apply it to the ends of the gut so as to swell and spread it out like a rivet head. This is a matter of some nicety, as if the wire is too hot, it will burn off the gut, and do no good. Cement is quite unnecessary."

Invisible Ink.

IAGO CYBI writes:—"Dissolve 1 ounce (fluid) of common oil of vitriol (sulphuric acid) in a pint of soft water, stir well, and allow it to cool. Write with a clean pen. When dry it will be invisible, but if held to the fire, it turns an indelible black. The cost of the ink is 1d. per pint." [When your letter reached me part of the writing was visible. I was obliged to expose the paper to a strong heat, which slightly scorched it before the rest of it became legible. It then came out a strong black, so I am inclined to think the recipe will be useful to those who require ink of this kind.]—ED.

Le Page's Carriage Glue.

B. H. F. (*St. Petersburg*) writes:—"In the January Part of AMATEUR WORK, in 'Amateurs in Council,' you say that Theodor Eckhardt, 3, *Crown Court, Milton Street, London, E.C.*, is the agent for Le Page's Carriage Glue in Great Britain. I beg leave to inform you that three months ago I wrote for some of this glue. After some time I received an answer from Phillips and Co., of the same address as the above, who informed me that they were sole agents for 'Le Page's Glues' in Great Britain." [I am obliged to you for the correction given above. M. Eckhardt's name appears on the circulars, etc., in my possession. Probably a transference of the Agency has been made to Messrs. Phillips and Co., who are apparently M. Eckhardt's successors, as their place of business is the same.—ED.]

The Exclusion of Draughts under Doors.

Dom Bedos writes:—"There are many very excellent ways in common use, but the following, which is, to the best of my knowledge, my discovery, I have found to answer, where the floor was higher inside the door, necessitating the door being cut, shaving nearly ¾ inch between it and the sill. When there is a carpet not extending quite to the door, exactly the same circumstances arise, and also in old houses when the jambs are not plumb. The difficulty, not to be met by any other means I am aware of, is therefore a common one. This contrivance is applied to the *inside* of the door, which can only open square, being stopped by a block, not flat against the wall. It consists of a triangular lower board, B, which rises at its lower side by springs, H, directly the door is half an inch

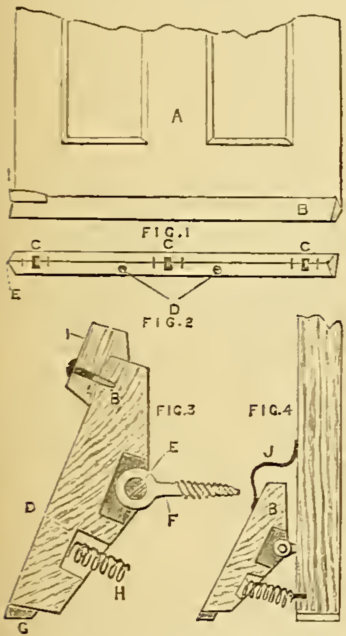


Fig. 1.—Bottom of Door with Louvre Board attached. Fig. 2.—Back of Louvre Board. Figs. 3, 4.—Sections of Louvre Board, etc., showing mode of fixing it.

A, Door; B, Louvre Board; C, Mortises for Screw-eyes F; D, Holes for Springs H; E, Wire; G, Felt; I, Arm; J, Leather Strip.

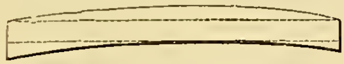
open; when the door is closed the arm, I, strikes the jamb, turns over the course, and closes its felted edge, G, tightly against the floor. In Fig. 1 we have the general appearance of the course finished and attached; in Fig. 2, the back of it, showing wire, E, running in a groove, forming the hinge; also, mortises C and B respectively, to contain heads of screw staples, F, driven into the door, and the springs, H, when closed up. Figs. 3 and 4 are sections, showing how the wire passes through the three staples, F; it is secured to B by short wire staples at each side of slot C; J is a strip of ornamented leather, glued and nailed, to exclude any draught from above and to prevent any dirt falling between. The springs can be made by cutting an ordinary bell spring in two and drawing it out a little, as in this case it works by compression.

Marquetry.

Twist Drill.—If you will send me your proposed paper on Marquetry, and the mode of executing this ornamental work, it shall receive my best attention and consideration. Append your name and address to the article. I have the latter; had I been in possession of the former, I should have written direct to you on this subject.

Warped Oak Boards.

C. E. F. G. W.—The boards that you wish to restore to their original form and flatness being, as you say, thick oak boards, it will be a very difficult matter to straighten if they are warped lengthwise, and indeed I think it would be useless even to try to straighten them, as they have, no doubt, warped in seasoning, and the only safe remedy will be to reduce the thickness by planing on each side, as in the annexed diagram, which is presented in a greatly exaggerated form, in order to show the process more clearly. If, however, the boards are warped in the width only, and you have, as you say, tried the heat and damp process (which, I may add, is the correct thing to do) without success, then you must plane down the two edges on the one side and the centre of the other. If,



TREATMENT OF WARPED BOARD.

again, they are warped at the corners, you must also plane them. You will require a pair of trueing-sticks, for this work to ascertain when the boards are out of winding in the planing-down process. All matters of this kind are practically dealt with in the "Finsbury School of Amateur Mechanics," conducted by Mr. Thomas J. Syer at *Finsbury Square Buildings, Chiswell Street*, and although this and other matters directly connected with the various branches of carpentry and joinery may not be specified in Mr. Syer's prospectus, yet he is always ready and willing to afford amateurs in town or country, who may not be able to join any of the classes as regular students, private lessons on any points at which they may be at a loss whenever it may suit their convenience. And every practical man is aware that a few minutes' actual showing is worth far more than any amount of direction by written instructions.

Small Hand Drill.

W. B. (*Sale*).—Drills on a large scale for the workshop may be made by amateurs, and they will save money by doing so; but for small work, I recommend you to purchase a drill of any local dealer in tools, or of any of the dealers whose names have been mentioned in these pages. As far as the *principle* goes, this has been sufficiently explained in the various articles in which instructions have been given for making drill frames and drills. You want a frame to carry the drill, and a spindle to which the drill point is attached by means of a holder. Motion may be imparted to the spindle by a bow and cord, the latter being passed once round a grooved wheel of some little length, like a small cotton reel attached immovably to the spindle, so as to carry the spindle and drill round with it when the bow is moved rapidly backwards and forwards. But I think you would find the Archimedean drill sold for small work most convenient and suitable for your purpose.

Rabbet-Cutting Adjustment to Saw.

Bing writes:—"In cutting a rabbet I have frequently found a good deal of trouble in getting it quite evenly cut throughout, especially if, as it was the case with me the other day, in making a frame from

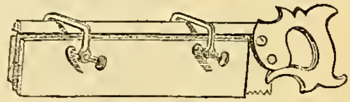


FIG. 1.—PERSPECTIVE VIEW OF TENON SAW WITH ADJUSTMENTS ATTACHED.

a beautifully grained piece of oak, which contained a couple of nice knots. So I thought I might rig up a tenon saw to do the work, and I find it answers admirably. As there are many amateurs who do not possess rabbeting planes I enclose a sketch, which I think, will show them the way to get over the difficulty. This may be known to some, but as I have never seen or heard of it before, I imagine it may be acceptable to many." [Your suggestion is a very good one, and may be rendered useful in other ways in which wood is required to be cut of a certain depth, as, for example, in cutting notches for halving pieces together, and in cutting grooves in uprights to receive shelves, etc.; but for these purposes the wider board on the right of the saw in Fig. 2 must be removed, and the other boards must leave just so much of the saw-blade exposed as is equal to the depth of cut required—Ed.]

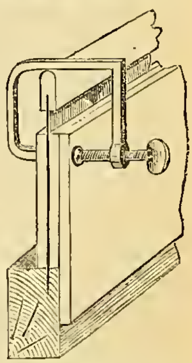


FIG. 2.—END VIEW OF SAW WHEN RABBET IN TIMBER HAS BEEN CUT TO DEPTH PERMITTED.

Articles in Glass Bottles.

W. W. (*Norwich*).—Other structures than the cross, etc., can be put together within glass bottles. Not long ago, when passing through a street near the water in a large river-side town, I saw two bottles in a window placed on a small shelf, neck to neck, containing rude representations of a steamer, with funnel, masts, etc., etc. As J. W. S. (*Alston*) has already told us, whatever the object may be, its parts are first fitted together, and then put into the bottle one by one. When once within it, they are again put together by the aid of wires, etc., used to coax each piece into its place. A great deal of trouble must be involved, and time taken in the operation.

Six Months' Amateur Work in Natal.

Mabuta, who writes in his "Kaffir name" from Natal, has sent me a long letter in reference to many things, and especially to the work that he has done in the course of six months as an amateur. I give extracts from this letter, partly because I think they will be interesting to the majority of those who read this Magazine, and partly because there are subjects, such as making gun-stocks, stringing racquet-bats, etc., on which I should like to have papers from those who have had practice and personal experience in such kinds of work, and are willing to write on them for the instruction of others.

"Your new Prospectus," says Mabuta, "ought to satisfy most people, whatever their particular hobby may be; but I do not see any mention of the article on 'Banjoes,' promised some time ago. [Jack Horner. Please note this!—Ed.] And there is a subject I should very much like to see a paper upon. That is, 'How to Stock a Gun.' I think you would be doing a kindness to many colonial, and possibly to many home Amateurs, who may have broken stocks which they might replace themselves, if they only knew how to set to work.

"I have just finished a new stock to a muzzle-loader, and have made a satisfactory job with regard to fit and appearance; but I should be sorry to tell how long I spent over it, from not knowing how to commence, and also perhaps from the want of proper tools. The only wood available was a very hard colonial wood, commonly known here as Stinkwood (*Oreodaphne bullata*), which added to my difficulty.

"If it is possible, try and squeeze a paper on the subject into Vol. IV., as here, where everybody rides after game, and horses will tumble into holes, or buck, or do something stupid, guns are always getting broken, and gunsmiths are few and far between, and very independent if you find them.

"I should like to say with what great interest I have read Mr. Allen's chapters on the Violin. It has always been a puzzle to me, 'Given a block of wood, make a fiddle;' but after following Mr. Allen, I think anyone with a pair of hands ought to be able to turn out a decent, if not superior, article in the way of fiddles. When the papers commenced, I read them for information, but have since satisfactorily repaired a violin and bow, much to the owner's delight, who did not expect to get them repaired in the colony.

"I think to show the grumblers, who wish their particular hobby to receive more than its appointed space, that *all* knowledge comes in useful at some time or other, I will give you a list of the jobs I have either completed during the last six months, or have on hand at present. (I may say that, owing to one of the turns of the wheel of fortune of colonial life, I am keeping wife and family by my hands.)

"My list shall commence with pack-saddle for Gold Fields (light American pattern); pack-saddle, with slung chairs to carry children; three signboards (I am a bit of an artist, and so can improve a little on pro-work of the kind one sees in the colonies); several broken gunstocks (I mend a stock on the principle that two pieces of wood, properly joined, are stronger than the solid wood); one flute to repair and make case for; one dozen stock-whips (I learnt to work raw hide in America); several cowhide riding-whips; clockcase to repair, veneered on oak (a very troublesome job); one pair sculls for river-boat; one microscope to clean and repair; several tennis racquets to repair and regut (I should be glad of some advice on stringing racquets. I have a way of my own that is fairly successful, but should be glad to know the proper way); banjo to repair and put new skin on; trap to repair (hood broken from upset); photos to mount and frame; lamps to repair (which means use of soldering irons); stick to varnish, and carve head for knob.

"I will stop now, and say nothing about furniture, of which I have turned out a good deal. I have just finished a hanging sideboard, new design of my own, the advantages being the small space occupied and handiness of cupboards.

"Now I think anyone reading the above list, which is not a fancy one, but taken from my work diary, will admit that Amateur Work must have been very useful to me. For almost every job mentioned above, I could find some hint useful in its pages. 'Organ Building' I have not made use of practically yet; but then how much more I think of myself now that I know how an organ may be built!

"I used to tune pianos about here some time ago; but have given it up now, professional tuners make regular rounds through the country: and with all due deference to Mr. Conolly, I maintain an amateur had better leave his own piano alone; try on his neighbours' if they are silly enough to allow him before he had learnt (I am supposing a man with a decently musical ear) to distinguish the waves of sound sufficiently distinctly to temper his fifths, the unfortunate piano would be worn out, or all the wrest pins would be loose. Though I had a good deal of practice at one time, I prefer to pay a guinea to the 'pro.' when he comes round; and I say as my opinion that no one can tune a piano unless he has *continuous* practice. The parallel drawn by Mr. Conolly between a harpist or violinist who cannot tune their instruments, and a pianist who cannot tune his, is scarcely reasonable to my mind. It is the constant practice that the violinist has that enables him to tune with such ease. If a pianist had to tune every time he performed on his instrument, I have no doubt he would be equally clever with the violinist. Even then he would require a very much more delicate touch with the wrist. The only way to learn to tune (if the pupil is not too old) is to go to a piano manufactory, and pay to be allowed to drag up the strings on the pianos in course of manufacture; then, after doing about a dozen a day for some months, the amateur might be able to tune a piano decently; but if he confined himself to tuning his own, both hand and ear would very soon get out of practice, and all his labour would be in vain. At the same time, I am very much obliged to Mr. Conolly for his papers, as they are very interesting to anyone who has an idea of the difficulties of tuning. I am afraid your circulation is small in South Africa. People are not self-helping here; and though I have lent my copy to many about here, I do not think I have added a subscriber to your list. If you would only tell the people how to live without any work at all, they would all subscribe at once. But *how* to work! Dear me! no!"

Stand for Drills, Eccentric Cutters, &c.

J. L. D. (*Fulham*) writes:—"The arrangement I made for holding drills will probably prove useful to many of your readers. Nothing is more disheartening than a search for a particular drill in a drawer or box half filled with broken and whole drills, pieces of steel wire, reamer's taps, and all the other et ceteras which are sure to accumulate in such a receptacle. My drill-holder is a disc of mahogany, I inch thick, and nicely turned and polished. Holes of different sizes, to suit the shanks of the drills, are bored in concentric circles round this, and about three-eighths of an inch apart. The shanks of the drills are inserted in these holes, and the points stick up, inviting inspection. My stand is only 4 inches in diameter, and has spaces for 96 drills and 7 drill-holders. Half a cocoa-nut shell, smoothed and polished, fits on a ledge, and makes a nice cover. Placed on a bracket in my workshop, it forms quite an ornament. This may seem so simple as to be scarcely worth writing about; but if we would all write what we know, much useful information would be ventilated."

Sharpening Razors.

Dull Razor.—If you are continually sending your razor to be sharpened and set and have had it ground once, I am afraid you scraping tool is far from being as good as it ought to be, and no instructions for sharpening razors will be of any use to you. Buy another, and try what that will do, and rid yourself of the instrument that refuses to be sharpened. A still better remedy than buying another razor, is to give up shaving. The query, "Why shave?" is surely as deserving of consideration as the Starr-Bowkett, eye-holding, heart-searching interrogation, "Why pay rent?" And it is more easily answered, for it is in the power of any man to abstain from shaving if he chooses, though it is not possible for every one to avoid the landlord's appeal at quarter-day, however much he may wish to do so.

Picture-Frame Making.

J. A. B. (*Stamford Hill*).—You say that you have taken in Amateur Work since the commencement, and ask for an article on Picture-Frame Making. Let me call your attention to the papers on this subject by Leo Parsey, which appeared in Vols. II. and III.

Subjects for "Amateur Work."

J. P. K. (*Cheltenham*) is thanked for his kind suggestions; but experience has shown that the subjects he does not care for are taken up with considerable zest by many. All tastes must be consulted and provided for, and those subjects that J. P. K. suggests are being looked after for treatment in due course of time.

Electric Bell Indicators.

SWITCH.—There will be a paper on this subject by Mr. Edwinson in the April or May Part of AMATEUR WORK.

A Sideboard for the Dining Room.

G. F. J. (*Birmingham*):—You ask for advice on making the sideboard described in Vol. I., page 49, and illustrated by drawings of the front and end elevations. I will help you as far as I can, but having looked through the description, I see nothing in it that will not be perfectly clear to the professional workman, whose assistance you propose to seek. With regard to your own difficulties: *Firstly.* Although it is not so stated, the sideboard is evidently drawn on a scale of ¾ inch to 1 foot, but this has nothing to do with the preservation of proportions when drawn on a larger scale. The height and width, and proportions of every part will be relatively the same to whatever scale you choose to enlarge it—whether you make a full-sized working drawing of it, or draw it to the three-quarter scale, two-thirds scale, half scale, one-third scale, quarter scale, one-sixth scale, or one-eighth scale, or, in other words, to a scale of 9 inches to 1 foot, 8 inches to 1 foot, 6 inches to 1 foot, 4 inches to 1 foot, 3 inches to 1 foot, 2 inches to 1 foot, 1½ inch to 1 foot. I had hoped that all matters of this kind had been made clear by the paper on "Working Drawings: How to Prepare and Produce Them," Vol. I., page 7, but I am sorry to find that reading to scale is yet far from clear and easy to many amateurs. *Secondly.* It is not necessary to make drawings of all the separate parts. Clear and accurate drawings of the front and end elevations on quarter scale will be sufficient for any professional cabinetmaker; but for the turned parts, pillars, pilasters, etc., it is as well to get out full-sized drawings. *Thirdly.* If you are going to make the sideboard in two parts, you must introduce the "raised board or step at the back," because that is the basis or foundation of the upper part, which serves as a connecting link, so to speak, between the framework at the back and the pillars in front. When made in this way, it will be better if the pillars are mortised into the board on which they stand, and that the edge of the board be shown from end to end, and not broken by the bases of the columns, as shown in the drawing, in which they are drawn as being notched into it. If you make it all in one piece, which is inconvenient for moving it, you may connect the two parts by mortising the pillars into the slab that forms the top of the lower part, and attaching the back, partly by mortising and partly by screwing it to the hinder edge of the slab. *Fourthly.* I cannot spare space to give a sketch of the back of each part, and this is all the less needed, because you "propose to employ professional assistance." Moreover, a glance at the back of a chest of drawers or any sideboard will show you how this very simple part of the work is done. *Fifthly.* All the parts that are hidden from view, as back of top and bottom parts of drawers, etc., may be made of pine, but all parts exposed to sight must be of walnut, if you intend to make the sideboard of this wood. *Sixthly.* If anyone who has made this article of furniture will send me his address, I will forward it to you, that you may correspond with him with the view of getting any wrinkle from him. *Lastly.* I will consider your suggestion with regard to the "Sale, Purchase, and Exchange Department," but I do not think it can be adopted, because it would increase the cost of producing the Magazine, to which the Publishers would naturally object. Moreover, two out of the four parts of this Volume that have been already published, *i.e.*, the Parts for December, 1884, and February, 1885, have been increased by eight pages to satisfy correspondents seeking advice, etc., through "Amateurs in Council," and for this increased outlay on their part, the publisher's get nothing, but are out of pocket, and the Editor's work is greatly increased without the slightest benefit to him, beyond the satisfaction of knowing that he has done his best to meet the demands of all inquirers. But, as you know, omelettes are not to be made without breaking eggs.

The "Shipman" Engines.

L. S. D. (*Jamaica*) writes:—"In forwarding you Messrs. Barnes and Co.'s list, I have taken advantage of the opportunity to transmit you at the same time a descriptive catalogue of the 'Shipman' Engines, which possibly, as they are a recent invention in America, you may not have seen or heard of. They are, without exception, the neatest and most useful little engines for an amateur's workshop I have ever seen, and meet a long existing want, viz., a cheap, yet safe, motive power to work a lathe or fret-saw; and their moderate price brings them within the reach of most amateurs. I have not got one as yet myself, though I have written for one; but the demand for them in America is so great just at present, that I was informed they could not undertake to complete the order for some months. I have, however, seen both of them (Nos. 1 and 2) at work in the workshop of an amateur friend out here, and they fully meet all that is said of them. The smaller one—that at 50 dollars, or £10—is a perfect little toy in appearance, yet it will work up to nearly, if not quite, a half-horse power; at a slight pressure it worked a large screw-cutting lathe with the greatest ease. The fuel used, as you will see, is kerosene oil; but I need not further describe it, as you have all the information wanted in the catalogue. I think it is well worthy of notice in AMATEUR WORK." [I have much pleasure in finding room for the above communication from L. S. D., who, as it may have been noticed, writes from Jamaica. As far as it is possible to judge from the price list before me, these engines seem to be just the things for motors for amateurs, as L. S. D. says. No. 1, Stationary Engine, sold for 50 dollars, or £10, will propel any kind of foot-power machinery. No. 2, sold for 100 dollars, or £20, is suitable for driving light manufacturing appliances, and propelling steam launches and pleasure boats, being reversible for this purpose. No. 3, a larger and more powerful engine, is now being constructed, and will be in the market by May next. With regard to the working of this description of engine, the manufacturers say that it differs from all others in these particulars:—

1st. That it requires no engineer.

2nd. That it is absolutely safe from fire or explosion.

3rd. You can light it in the morning, and it takes care of itself till night.

4th. You only consume the amount of fuel you use for power taken.

5th. When engine stops expense stops, as it puts its own fire out, and lights it again when necessary.

The "Shipman" Engines are manufactured and supplied by Mr. A. H. Shipman, *Bismarck Place, Rochester, N.Y., United States of America.*—ED.]

Velocipede Scroll Saw.

L. S. D. (*Jamaica*) writes:—"In Part 37 page 92, in 'Notes on Novelties,' I observe you call the attention of your readers to the American Velocipede Fret-saw, of which you give a sketch, and I believe I am the correspondent you refer to as having sent you some American catalogues. I have had one of these saws in use for some years, and I can strongly recommend them to your readers. They are the patent of an American firm—Messrs. J. and F. Barnes, of *Rockford, Illinois*—whose catalogue I send you by this mail, as it contains several other useful attachments to the saw-table, among which I may mention: 'The Foot Power Former,' 'Grinding and Polishing Head,' and 'Fluting Attachment,' pages 12, 14, and 37 of catalogue. I have them all, and they are, without doubt, most useful appliances in an amateur workshop, especially the Foot Power Former. By attaching this to the table, or, rather, stand, for it has a separate table of its own, the edges of brackets, scroll-work, or panels, and, in fact, work of every description, whether circular or square, can be readily moulded, knives being supplied of various styles and shape for the purpose. The Fluting Attachment is for grooving or fluting table legs. The change from the fret-saw to the 'Former' is easily effected in a few minutes. And what recommends Messrs. Barnes and Co.'s goods still more is their cheapness. The fret-saw, with drilling attachment alone, is 12 dollars, about £2 10s.; the 'Former Attachment,' £2 extra, and the 'Fluting Attachment,' 12s.; but a large discount of from 25 to 30 per cent. is allowed off these prices, if you deal direct with the firm. I have had considerable dealings with Messrs. Barnes and Co., and have found them excessively obliging, and they will always procure for their customers any article in the way of tools, or other amateur appliances they may not themselves have in stock, and they will, I am sure, forward their catalogue, free of charge, to any of your readers who may apply to them." [I am much indebted to you, and so, indeed, are all the readers of this Magazine for your valuable communications. You are the correspondent to whom I referred, and it was the Barnes Velocipede Fret-Sawing Machine of which I was thinking when I wrote. It is owing entirely to your previous letter, I think, that they have found their way into this country.—ED.]

American Organ.

T. S. writes:—"I do wish that you would comply with the request expressed by more than one of your readers for instructions for making an American Organ. I am quite prepared to admit that you have devoted a large portion of the Magazine to that grand old instrument, the organ proper; but pray reflect that many of us, with the best will in the world, have not the space, nor the time, nor the money requisite for building that instrument. Do please consider whether it will be possible to induce Mr. Mark Wicks to take up the subject." [Mr. Wicks tells me that he cannot undertake to write on this subject. I am, therefore, obliged to postpone it until I can meet with a writer who is competent to handle it.—Ed.]

Casket in Fretwork for Playing Cards.

J. F. T. B. (*Dublin*).—The fault in my Fret-Cut Card Casket pointed out by you will be found to be an error of the artist. In my drawing the top left-hand division and the bottom right-hand division of the cribbage board was blind (by looking at the corner pips my meaning will be clear). He probably thought that I had inadvertently omitted these drill-holes. How he managed to get eight crenations on the left, and six only on the right, I cannot think; the number should be equal. In my drawing, I think, each side had in this division six blind crenations. These extra divisions were added to the cribbage-board to complete the border, and for show only. If you will refrain from drilling them (or should you have unfortunately drilled them already, a small plug can be inserted), you will find the board correct as you describe it. Twelve divisions each of ten holes plus two for game; these latter you will find in the corner pips. I would further call attention to the following errata: (1.) One drill-hole has been omitted at the bottom left-hand corner. (2.) Fig. 10 has been printed upside down. (3.) The card design on the lid has been drawn much more fragile than my copy, nearly all the parts of the figures being much thinner than I should wish.—F. C.

Windmill and Pump.

H. S. N. (*Bishopscastle*).—In reply to your queries respecting the Windmill and Pump described by T. E. R. (*Teddington*), in Amateur Work, Vol. II., page 513:—(1.) I do not know where a good lift and force pump may be obtained for £1, unless second hand. You can obtain one for 29s. from William Reid and Co., 5, *New London Street, London*. For this price the diameter of barrel will be 2 inches. The connections would be screwed, or tinned for lead pipes, at option. This type of pump has a broad-flanged base, suitable for your purpose. It is guaranteed to raise from 27 feet. Suction and delivery pipes 1 inch diameter. (2 and 3.) The hole for connecting rod must be elongated to clear the radial motion. The total amount will be: stroke of pump plus diameter of connecting-rod plus clearance (1 inch or so). Divide this equally on each side of the centre of crank-shaft. (4.) According to T. E. R., the height of poles would be about 10 feet, but you must be governed by situation of well and size of windmill. The higher the better, within reasonable limits; say from 15 to 20 feet. Don't spread the poles too much at the base. If you do, the vanes won't clear without considerably overhanging, which would render the shaft liable to be bent in gusty weather. (5.) Yes, easily, if the vanes are of good area, and a breeze going; 20 feet high if you like. Lastly, First get your pump Until that is procured, or the stroke and diameter of it ascertained, nothing can be done. The windmill should be designed so as to work efficiently in a summer breeze, and yet be strong enough so as to withstand average winter weather. Perhaps it would be better to make the arms and sails or vanes just strong enough to stand a stiff breeze, then, in case of a sudden gale, the structure might be saved at the expense of the sails. I shall be happy to assist further if in my power.—Olla Podrida.

Electric Bells.

Dawlish.—Connect up the bells to the push or switch, as shown in the annexed diagram. That is, connect one wire from the battery to No. 1 bell, then from bell on to push, and back to battery in the ordinary way. Connect up No. 2 bell in a similar manner to a junction line, as shown at A, then from bell to the same stud on switch or push as that to which No. 1 is attached. If, now, No. 1 bell rings loudly whilst No. 2 scarcely rings at all, place a coil of wire in the circuit at B, to balance the resistance of the circuit of No. 2 bell. The proper quantity of wire in the coil should be nearly equal to that of the extra wire in No. 2 circuit. The bells should be of equal size. If one has less resistance than the other, it should be put on the longest circuit. It may be necessary to use larger cells in the battery if required to ring two bells at once.

Fret-Saw Attachable to Sewing Machine.

Anxious.—Queries can only be answered through the medium of "Amateurs in Council," and not by post. In reference to Fret-Saw Attachment, described in page 292, Vol. III., of this Magazine, the small wheel, G, may be made of boxwood, and can be turned by any turner to size required, or you may procure a metal wheel, grooved like the wheel of a pulley, which would do as well. This you might purchase of a dealer in marine stores, if you could not get one at the nearest ironmonger's. Lastly, the small bar, B, about ½ inch square, and the slide, F, which are extremely simple, and the bar connecting E and G, any smith or ironmonger would make or get made for you. These fittings must be made to order, if you cannot make them yourself, or substitutes for them must be contrived out of any suitable waste material. You cannot purchase them anywhere ready to hand for the purpose designated.

Works on Clock Repairs, etc.

Clocks.—The book you speak of exists only in title; it is announced as being "in preparation." With regard to the possible publisher, you know as much as I do, and that is—just nothing. A series of reliable papers on this subject, and replete with really useful and practical papers, is now being written for this Magazine by a contributor on whom I can depend. He is a busy man in other ways, and cannot be hurried over his work; and, although I have his first paper in my hands, I refrain from producing it until the work is far advanced, that disappointment may not accrue to readers through too long intervals between the appearance of successive papers. Meanwhile, I may refer you to "The Watchmaker's Handbook," by Claudius Saunier, published by J. Tripplin, 5, *Bartlett's Buildings, Holborn Circus, E.C.*; and "Clocks, Watches, and Bells," by Sir Edmund Beckett, Bart., published at 4s. 6d. by Messrs. Crosby Lockwood and Co., *Stationers' Hall Court, London, E.C.*

Telephone Transmitter.

S. W. O. (*Croydon*) asks:—Will Mr. Edwinson kindly tell me: (1.) Is the carbon transmitter, described in Amateur Work, page 142, Vol. IV., used for the same purpose as Professor Bell's telephone? (2.) How is the battery to be joined to the transmitter? (3.) Must there be two transmitters *exactly alike* to carry on a conversation? (4.) Is the carbon transmitter only a toy, or an instrument capable of doing good work? Your queries were forwarded to the gentleman who kindly supplied the first information concerning the transmitter, and he has replied to them as follows: (1.) It is not so used, as it is a transmitter only (Bell's telephone is both transmitter and receiver). It is used for transmitting, not for receiving. (2.) Calling the two stations in the diagram A and B, and supposing, as we are justified in doing, that they are not far apart, the circuit would be thus: Wire from battery to transmitter at A, thence through receiver at A to receiver at B, from thence to transmitter at B, and from this to other pole of the battery. A key or switch should be placed in circuit, and this must be thrown open when the instruments are not in use. The battery for real work should be two or three Leclanché quart cells, placed as shown in diagram. The battery must be connected with the receiver in such a manner as to avoid demagnetising their magnets—that is, the current must be sent through the wires on their bobbins in a direction to maintain the poles of the magnets unaltered. (3.) There must be two transmitters and two receivers; two transmitters alike, one at each end of the line, two receivers alike, one at each end of the line, as shown. (4.) If properly made, it is by no means a toy, but the only instrument of the kind in commercial use that is suitable for very long distances, and for noisy places; while for short distances it is better than any other. For medium distances it is about equal to the Blake transmitter. I have used it over 450 miles of overhead wire with perfect success, when ordinary instruments used by the Exchange Companies gave no audible result. For concerts and operas I have known one of the same transmitters give splendid results in one hundred telephone receivers at once, every variance and tone of solo, chorus, and orchestra being faithfully given. As it is patented, it must not be used for any purpose except amusement, and that only for the owner's own amusement.—G. E.

INFORMATION SUPPLIED.

Best Chuck for Model Engine Work.

W. C. G. (*Lewisham*) writes :—" In reply to S. M. L. (*Goderich, Canada*), if you apply to the Britannia Company, *Colchester*, you can hear of a very efficient chuck for your purpose, which will grip tighter and last longer than any other. It will hold regular or irregular forms."

Facing up End of Roller in Lathe.

Twist Drill writes in reply to J. H. (*St. Helens*) :—" To face up the end of a roller in lathe, take a gouge, with the corners ground well back, as in annexed illustration, and holding it on its side, apply the middle of the edge to the wood at a distance from the end not greater than the *depth* of the curve. If the wood is very natrue, mark a circle with chisel as near as possible to the end, and cut the wood away by alternate cuts with the point and side of chisel. Then apply gouge."

FORM OF GOUGE FOR FACING UP END OF ROLLER.

Double Fret-Saws.

J. E. (*Liverpool*) writes :—" In answer to Iago Ctbi's enquiry for Double Fret-saws, I beg to state that they can be obtained from Mr. G. Busschotts, 33, *Park Lane, Liverpool*, in large or small quantities, at 6d. per dozen, or 4s. per gross. I have used these saws, and find them very useful for fine work, as they require no turning round when cutting sharp corners. They are known by the name of the 'Demon Saw.' I believe Mr. Busschotts is the only importer of them, as I have never seen them in any other shop in this city."

Grooving Tool.

Twist Drill writes :—" In reply to J. H. (*St. Helens*), page 103, let me say that for grooving on end of wood, the easiest way is to make two cuts to the depth required with a circular or small dovetail saw, and the wood between can be removed with a chisel."

Iago Ctbi writes, in reply to J. H. (*St. Helen's Road*) :—" I do not know of any tool for grooving wood other than a plough or a grooving-saw, and I have worked at joinery for the last fourteen years."

Glass Staining.

Vicar replies to Parson :—" There is no really good practical book on above subject in existence. The best published is Snell's 'Enamel Painting on Glass,' 2s. 6d. (Brodie and Middleton, *Long Acre, London, W.C.*); or 'Glass Painting,' 2s. 6d., in Weales' Series, published by Crosby Lockwood and Co., *Stationers' Hall Court, London, E.C.* If Parson will send address, former will be lent him by Vicar. For historical and artistic side of subject, read Winston or Westlake, both published by J. Parker, *Strand*; they are expensive books."

Springs for Mattresses, Chairs, etc.

C. F. J. (*Birmingham*) writes, in reply to Sailor :—" You can get any kind of springs used in making chairs, sofas, and mattresses of Messrs. Rylands Brothers, Limited, *Wire Mills, Wire Netting, Wire Rope and Galvanising Works, Warrington.* They are made in various heights, ranging from 4 inches to 12 inches, and of wire ranging from 12 inches to 6 inches gauge, the gauge being regulated according to height. The springs are supplied either 'coppered' as bright, and are made with coiled ends—that is to say, with the ends of the wire twisted over the commencement of the second turn, both top and bottom—or with tied ends. The prices of springs with coiled ends, coppered, range from 3s. 9d. to 23s. 9d. per gross; with coiled ends bright, from 3s. 3d. to 22s. 9d. per gross. Springs with tied ends are 1s. per gross less. You will find Messrs. Rylands' advertisement, giving prices for all sizes, in 'The Cabinet Maker and Art Furnisher' for January; price 6d. I may add that the number of this publication that I have just mentioned well deserves the attention of amateurs who fancy Cabinet-making. It contains some very useful remarks, accompanied with six good illustrations of the interior of an artisan's model dwelling, furnished on the principle advocated by Mr. Norris, and now on exhibition at the New Art Museum in Queen's Park, Manchester."

Vicar writes, in reply to Sailor :—" For chair springs, etc., try Rylands Brothers, *Wire Works, Warrington.* 4 inches high, 3s. 3d. per gross, to 10 inches high, 10s. per gross."

INFORMATION SOUGHT.

Cost of Band-Saws.

Twist Drill asks,—Can anyone inform me of the cost of small band-saws for such an arrangement as that described in page 553, Vol. III.? The Britannia Company only mention a large machine in their catalogue.

Patterns of Carved Work on Hire.

C. R. W. asks :—Can you or any of your readers inform me where models for wood-carving or where wood-carvings are let out on hire as patterns, as it often takes five or six lessons to complete a panel, where if you had before you a specimen of carving to copy from, it would in many cases not require any instruction. [It is far more profitable to my mind to have the five or six lessons, for in these you would be laying the foundation for ultimate success, and you would get any tendency to go wrong set right at the outset. And having once got a fair notion of the *modus operandi*, you would be able to work direct from drawings in the flat without requiring an actual carving as a copy.—Ed.]

Wooden Foot Bridge.

J. C. (*Ireland*) has sent more explicit information with regard to the river over which he wishes to make a bridge. He says :—" I wish to make a wooden foot-bridge across a river which is sixty feet wide, general depth of water, two feet; but in rainy weather it rises to six feet, the water at that time is very rapid. The bed of the river is of clay, without stones. Height of banks over bed of river, five feet, so it overflows its banks to the depth of one foot. Will some amateur engineer give a drawing, with instructions for making the bridge. Also, a drawing of a machine for driving piles or supports for the bridge." [Even now J. C. has not mentioned the extent or distance to which the water extends on either side of the river when it overflows its banks; and this is an important factor if it be sought to build a bridge that shall be above water from end to end at the worst of times. It makes a great deal of difference in the construction of a bridge under such conditions, whether the land on either bank is flat or level, or slopes more or less gradually from higher ground to the edge of the bank. Correspondents requiring information cannot be too particular or precise in their data. When this is settled, J. C., I think, may feel sure of getting the instruction for which he asks.—Ed.]

Designs for Paperhanging.

Dado writes :—" Can any reader of Amateur Work tell me what size designs for paperhangings are required to be drawn? What is the value of such designs, say for cheap medium and high-class papers; and if there is any chance for an amateur at such work? what firms would be open purchase them?"

Colouring of Turned Work.

A. F. S. O. asks :—How is the colour made and applied on turned work? The turner at the Health Exhibition, in "Old London" used a blue on some three-legged stools. It looks like paint, but it is very smooth, and polished. I should like to know how to do red, blue, and green.

Design for Accordion Box.

Jungle Jack asks :—Will Mr. Stanford or any other brother reader kindly give me a design for inlaying front and lid of an accordion box—size, inside measurement, 13 inches by 10 inches by 6 inches? I should like it arranged so as to get two small stars in front and a large one on the lid.

Dimensions of Harp.

W. B. R. (*Southsea*) is making a harp, full size, and will be obliged to any subscriber possessed of a harp who will give him the principal dimensions—namely, height of pillar, diameter of pillar, at base and at top, width of arm at top, in which winding pegs are fixed, greatest width of instrument in horizontal line from pillar to junction of upper arm and body of harp, and length of body, and width at top and bottom.

Photography.

L. S. D. (*Jamaica*) writes :—" Will any of your readers or amateur photographers give me their experiences of the 'Sceuograph' I see mentioned in 'Scientific Recreations,' page 154, and advertised by the Scioption Company, *City Road*, or is there any other camera made suitable for tourists which answers the purpose better?"

SALE, PURCHASE, OR EXCHANGE.

Persons availing themselves of this Department of Amateur Work *are requested to note that—*

(1) *No Trade Advertisements can be inserted in this Department, which is open to bonâ fide Amateurs only. The Editor reserves the right of refusing to insert any notice.*

(2) *No charge will be made for the insertion of notices until their number be such as to render it absolutely necessary to do so.*

(3) *Persons writing in reply must forward application under cover to the Editor, in an envelope sealed down, with a Penny Stamp*

attached in the upper right hand corner, and the NUMBER *of the notice in the lower left hand corner thus:—*

NO. OF NOTICE here.	STAMP here.

(4) *Letters thus marked and enclosed under cover to the Editor will be forwarded immediately to owners of articles for Sale or Exchange, or persons wishing to purchase. No attention will be paid to any communications in which these Rules are not strictly observed.*

(5) *It is desirable that those who reply to notices in this Department should enclose to the advertiser, with their application, a stamped and directed envelope, in order to ensure a reply. When this precaution is not taken, the non-receipt of a reply within reasonable time can only intimate that the article in question is disposed of, or that the proposal made is declined.*

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298. **Scroll or Fret Sawing Machine**, on Iron Stand, Side Springs. Will take 18 inches in radius; drilling attachment, and 18 drills, and about 2 dozen saws. Made in beech. Price 18s., purchaser to pay carriage. Open to entertain exchange. (*Birmingham.*)

299. **Serials, Unbound.**—AMATEUR WORK, 3 vols., 10s. 6d.; Cassell's "Household Guide," 4 vols., 5s. 6d., carriage paid, or will exchange for Chemical Apparatus, Stoppered Bottles, or "Chemist and Druggist" for 1884. (*Edinburgh.*)

300. **Printing Press**, Squintani's Model, No. 3, chase 6 by 9 inches, self inking, 3 pairs good rollers. In working order. What offers? (*Leeds.*)

301. **"Carpenter and Builder,"** 6 vols. in cloth, 12s., carriage free. (*Belfast.*)

302. **Bicycle**, 54 in., Andrews; ball bearings and bent handles. Value £4 10s. Will sell for cash. What offers? or exchange for first-class Seven-stringed Banjo. (*London, S.E.*)

303. **Cassell's "Popular Educator,"** Parts 1 to 36 inclusive, unbound, clean and good as new, offered for 12s., cost 22s. 6d.; or will exchange for Parts 1 to 36 of AMATEUR WORK. (*Hull.*)

304. **"Amateur Work,"** unbound, clean and as good as new, in exchange for Bookbinder's Roll, Palette for Gilding, or Burnishing Tools for gilding back of books, or will sell for cash. What offers? Purchaser to pay carriage. (*Newbury, Berks.*)

305. **Printing Type.**—20 small Founts and 4 Founts Borders, and 3 sets Combination Borders for sale cheap. Will send specimens for ½d. stamp. (*Hailsham.*)

306. **Fretwork Patterns and Tools** for sale cheap. List sent on application. (*Hailsham.*)

307. **Hand Fret-saw Machine**, purchased from Britannia Company, with drill, bits, and oil can. Cost 10s. 6d., never used, will sell for 8s. (*Sevenoaks.*)

308. **"Young England,"** Jan. to Sept., 1883. Will sell for cash or exchange. What offers? (*Leamington.*)

309. **Books Wanted.**—"Family Doctor," 3s. 6d.; "Dictionary of Phrase and Fable," 3s. 6d. (*Leamington.*)

310. **"Amateur Work,"** Vol. I., newly bound. Will exchange for "Every Man his Own Mechanic," or sell for cash cheap. (*Cambridge.*)

311. **"Amateur Work,"** Parts 1 to 36 inclusive, clean, with Supplements complete. Will take 10s., buyer to pay carriage. (*Bangor.*)

312. **Busson's Organ-Accordion.** — 3½ octaves, 4 stops, viz., Sourdine, Forte, Tremolo, and Celestial. Nearly new, perfect. Cost over 6 guineas. Price £3 15s. Or exchange for good English Concertina. (*Rochdale.*)

313. **Magazines, Various**—"Knowledge," Vol. I., unbound; "Science for All," Parts 1 to 7; "Universal Instructor," Parts 1 to 6; "World of Wonders," Parts 1 to 4; all clean as new. Also 102 numbers of "Boys' Newspaper," and "Union Jack," Vol. I., in Parts. What offers for whole lot or any part? (*Rochdale.*)

314. **Amateur Work Bench**, of beech, about 54 in. long, 34 in. high, and 18 in. wide, as advertised at Hackney and New Oxford Street, at 22s. 6d. State cash terms for immediate purchase. Must be cheap. (*London, N.W.*)

315. **Organ Soundboard Wanted**, with 3 or 4 slides, secondhand and cheap. Size, about 4 ft. long, but not over 4 ft. 6 in. Compass, CC to F or G. Must be in perfect order. Also a Tenor C Dulciana, and pieces of thin pipe metal for tuning shades. (*Horncastle.*)

316. **Clarionet**, C, 6 German Silver Keys, in good condition, worth 20s. What offers, cash or exchange? (*Staleybridge.*)

317. **"English Mechanic."** Vols. 37, 38, and 39, for sale or exchange. What offers? (*Staleybridge.*)

318. **Organ Keyboard**, by Brooks. Keys 18 in.; new. Price £1 2s. (*Plumstead.*)

319. **Hydraulic Organ Blower.** Can be seen at work. Price £4 10s. (*Plumstead.*)

320. **Squintani Model Press**, No. 1, Self Inking, Rollers, Roller Mould, etc., complete; 6 Founts of Type, and Type Cases, in thorough order. Will exchange for good Lathe and Chuck, 3½ in. centre, or will take £4. (*Westerham.*)

321. **Microscope**, 3 Powers, Coarse and Fine Adjustments, Stage, Forceps, Condenser, Live Cage, in mahogany case, with drawer for slides, etc., lock and key. Cost over £3 3s. Would suit amateur photographer, as objects can be view horizontally with it. Will exchange for 5 in. Compound Slide-rest, in perfect order and of recent make, or Injector Furnace, by Fletcher, complete, with Blower, melting capacity from 2 to 6 lbs., or one of Fletcher's Petroleum Forges. (*Waterford.*)

322 **Organ Pipes.**—Wanted to purchase good set of secondhand Metal Pipes (Diapason Open), or Soft Reed Pipes, Tenor C to G, 44 pipes; also 12 Stopt Metal Pipes, CC to B. Must be in perfect condition, and not too large in scale. State price. Will give cash, or 7-stop Harmonium in exchange. (*Stratford, Essex.*)

323. **Castings and Forgings for Model Engine.**—Cylinder about 2 in. in diameter. Would not object to castings partly worked, if not injured. Must be cheap. State full particulars. (*Ashford, Kent.*)

324. **"English Mechanic."** — Last Six Vols., unbound, fair condition. What offers, cash? (*Bolton.*)

325. **"Design and Work,"** and **"Mechanical World."**—Vols. 9—13 inclusive, unbound, good condition. What offers, cash? (*Bolton.*)

326. **Fifty-inch Bicycle**, Roadster, good strong machine, ball bearings front, cones to back wheel, fluted forks, long bent handles, detachable cranks, cradle spring, long distance saddle, lamp, bell, pouch. Price £6. (*Bolton.*)

327. **Joiner's Tools**, comprising Jack and Smoothing Planes, with 2¼ in. irons, 2 ft. Rule with Slide, Mallet, Square, Bevel, Tenon Saw, Spokeshave, Saw Pad, Spring Dividers, Brace, with 10 Gilpin's Bits, Callipers, 4 Chisels, and Bicycle Wrench. Price for lot, 23s. in cash. Carriage paid. (*Grantham.*)

328. **"Boy's Own Paper."** — Will exchange any one of Vols. 1, 2, 3, 4, complete and well bound, for any one of Vols. 1, 2, 3 of AMATEUR WORK, bound. (*Edinburgh.*)

329. **Silk-covered Wire.**—2 lbs. What offers? (*London, W.*)

330. **"Knowledge,"** Nos. 1—77 inclusive. What offers? (*London, W.*)

331. **Enfield Rifle**, with 150 Cartridges. Cash, 30s., or offers. (*London, W.*)

332. **"English Mechanic."** — Sixteen Vols. to date, bound. Price, 40s., or 3s. per vol., or offers. (*London, W.*)

333. **Lathe Wheel**, with Centres. Price for cash, 6s., or offers. (*London, W.*)

334. **Electric Machine**, with 15 in. Plate, in strong box, with lock and key; also quantity of apparatus, including Leyden jars, discharger, brass chains, pith balls, etc. List sent on application. £6 wanted. What offers? (*Birkenhead.*)

335. **Cassell's "Technical Educator,"** complete, unbound, in exchange for Tools of almost any description, if in good and workable condition. (*East Dulwich.*)

336. **"English Mechanic."**—Last Nine Vols., with Indices, complete, offered for Vols. 1, 2, 3, of AMATEUR WORK, with Supplements, complete, or 13s. 6d. cash. Purchaser to pay carriage. (*Denny, N.B.*)

337. **Wheat Mill**, nearly new, cost 12s. 6d., will exchange for AMATEUR WORK, Parts I.—XXXV., complete, or for set of Carving Tools. What offers? (*Northampton.*)

338. **Lathe Headstocks and Flywheel.** Pair of 5-in. Headstocks and Flywheel, about 70 lbs. Crank Shaft, T Rests, etc., wanted. Must be cheap and sound: suitable for wood turning. (*Southend.*)

339. **Cod Line**, about 50 yards wanted, or any line suitable for sea fishing. (*Southend.*)

340. **"Amateur Work"** and **"Every Man His Own Mechanic."**—Wanted to purchase, secondhand, Vols. 1, 2, 3, of former, either bound or unbound, and Part XXXII. of Vol. 3. Also, secondhand copy of latter, bound or unbound. [*No address was sent with this notice.*—ED.]

341. **Various Books.**—(1) Whellan's "History of Northamptonshire," (2) Stanley's "How I Found Livingstone," (3) "Chemistry as Applied to the Arts and Sciences," 32 Parts, complete; all clean and nearly new. Will sell, or exchange for Lathe, etc., or Tinman's Tools. (*Penmaenmawr.*)

342. **"Amateur Work,"** Parts I.—XL. inclusive, in good condition. What offers in cash, or books in exchange? (*Dumfries.*)

343. **"Every Man His Own Mechanic"** wanted, bound, and cheap. (*Cambridge.*)

344. **Box of Drawing Instruments**, Electrum, Stanley's make, nearly new. Price £4. (*Derby.*)

345. **Parts of Four-and-a-half Inch Centre Lathe.**—Fast and loose Headstocks, Face Plate, Wheel-holder, large and small T Rest, 4 Steel Drills, single speed Flywheel, 15 inches in diameter, three smaller wheels, and strap. Price £1. Purchaser to pay carriage. (*Manchester.*)

346. **Bench Lathe Wanted**, 3 inch centre back geared, with slide rest, in good condition. (*Haydon Bridge.*)

347. **"Amateur Work,"** Parts I.—XL., perfectly clean. What offers? (*Sheffield.*)

*** List closed February 4th.

COMMUNICATIONS AWAITING REPLY

TUBA; SIOMA; IOTA; S. M. L. (*Goderich, Canada*); ENQUIRER; A. Y. S. (*Waterford*); NOEL; A. B. H. (*Edinburgh*); T. S.; VICAR; DATA QUÆSITA; L. S. D. (*Jamaica*); SUFFOLK WOODLANDS; R. B. (*Thirsk*); W. A. P. (*Windlesham*); TELEGRAPH; L. T. (*Abergavenny*); JACK LEIGH; J. T. W.; W. H. E.; F. W. (*East Dulwich*); OPIFEX; K. A. T.; STANMORE; AMATEUR VIOLINIST; R. G. (*Birkenhead*); E. W. (*Richmond*); A. F. S. O.; D. A. W. (*Stoke Newington*); AMATEUR ORGAN BUILDER; F. E. K. (*Malta*); PITCHPINE; J. G. (*Worksop*); OLLA PODRIDA; H. E. B. (*King's Lynn*); H. R. (*Leeds*); ROSELEA; S. W. (*Liverpool*); M. W. (*Burnley*); ARVONIA; EDWARDUS: T. B. B.; J. F. L. (*Deptford*); ASH PRIORS; J. C.; F. H. R.; LOCO (*Sohagpur*).

List closed Feb. 4th, 1885.

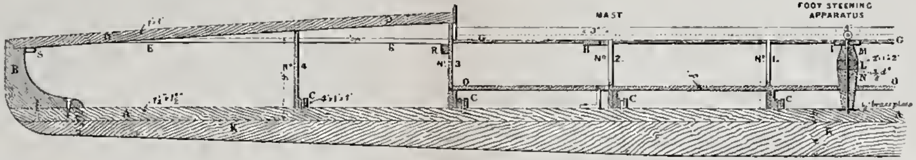


FIG. 4 LONGITUDINAL SECTION OF CANOE FROM STEM TO FOOT STEERING APPARATUS.

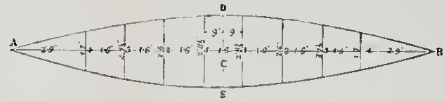


FIG. 1. DECK PLAN OF CANOE, SHOWING ALSO POSITION OF AND CORRECT BEAM AT EACH RIB.

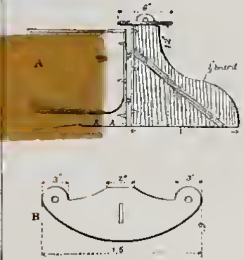


FIG 7. RUDDER, SHOWING ATTACHMENT TO CANOE (A) FORM OF TILLER (B)

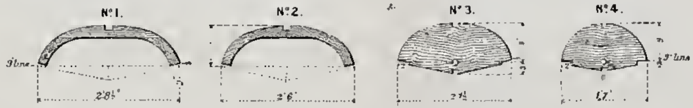


FIG. 3. DIAGRAMS SHOWING FORMATION OF RIBS OF CANOE.

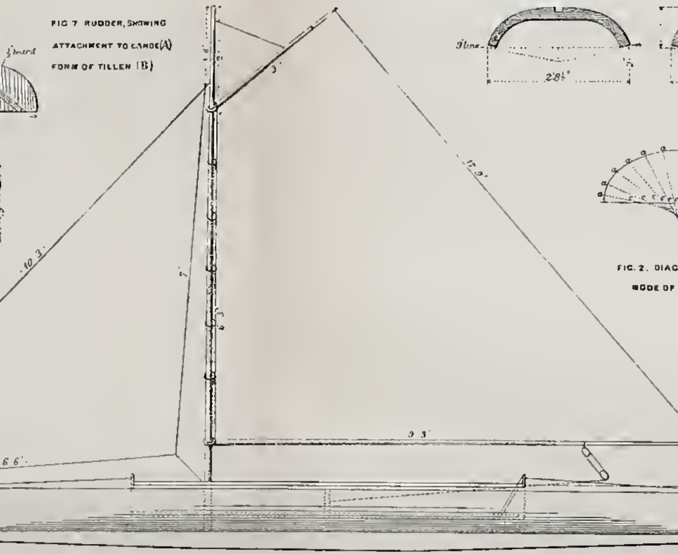


FIG. 6. RIGGING OF CANOE SHOWING DIMENSIONS OF SPARS AND SAILS.

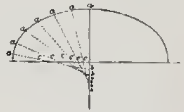


FIG. 2. DIAGRAM ILLUSTRATING MODE OF DRAWING ELLIPSE.

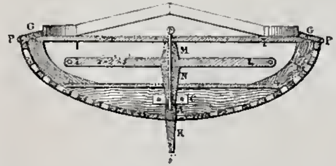


FIG. 5. TRANSVERSE SECTION OF CANOE, SHOWING ATTACHMENT OF RIBS TO KELSON, GUNWALE, SHIPS, ETC.

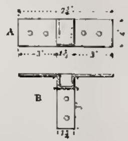


FIG. 8. SHOE FOR MAST
A. ELEVATION.
B. PLAN.

CANVAS COVERED CANOE

Designed and Described for
AMATEUR WORK, ILLUSTRATED,
by
MATTHEW STICKLEBACK.

Scale for Fig. 1. Quarter Inch to One Foot.

Scale for Figs 3 and 6 Half Inch to One Foot.

Scale for Figs 4, 5, & 7. One Inch to One Foot

Scale for Fig 8. One Eighth Inch to One Foot.

THE PANSY, AND ALL ABOUT IT.

By GEORGE J. HENDERSON.

I. INTRODUCTION—PROPERTIES OF SHOW PANSIES—PROPERTIES OF FANCY PANSIES—CULTIVATION—PREPARATION OF SOIL—PLANTING OUT—CULTURE IN POTS—PROPAGATION BY CUTTINGS—PROPAGATION BY SEEDS—ENEMIES.

NO doubt many of the readers of this paper have read the legend of Dr. Faust, who sold his soul to the demon so that he might live the better part of his life over again. Now we know that such things are impossible, and exist only as a fabulous story. Yet had I the power to work miracles, I would send this mighty earth of ours revolving back again to a period of about seventy years; I would then take the reader into the open country, and point out to him a poor insignificant looking flower, of very small size, with hardly any colouring, badly shaped, and one which very few persons would take any notice of; nevertheless, it found a friend, who took it in hand, and we owe that friend many thanks, for the common wild Pansy of the fields is the original parent of our now most splendid race of Pansies. It is about seventy years ago since the Pansy was first taken into cultivation, and by careful cultivation and propagation it has now attained a most wonderful degree of perfection in form, size, and colour. The Pansy has been my favourite flower ever since I was a lad. Years ago I

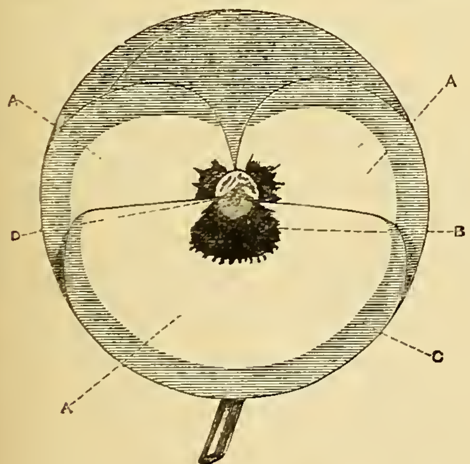


FIG. 1.—SHOW PANSY.
A, A, A, Ground Colour; B, Blotch; C, Belt; D, Eye.

had several beds of them, which I was very proud of, indeed I thought none could be any better (I had at that time never seen a named variety), but I was mightily mistaken. I may here inform the reader, that if I found any of the same in my garden now, I would quickly pull them up, and give them a grave on the rubbish heap, for they were mongrels, although at that time I thought they were just perfection, so much for my ignorance.

I will here inform the reader that there are two

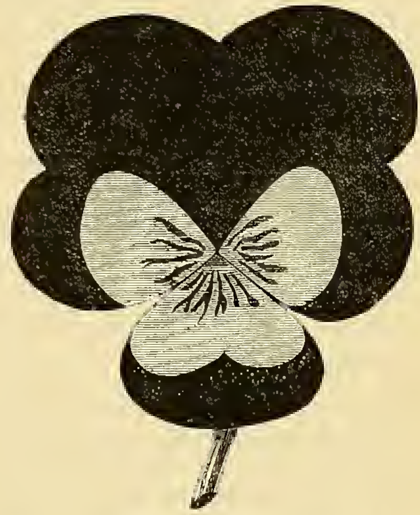


FIG. 2.—APPLEBY'S "WILLIAM THE FOURTH."
Show Pansy of 1833.

distinct kinds of Pansies, viz., the English or Show Pansy, and the Belgian or Fancy variety. It was about the year 1812 when the Pansy was first taken into cultivation. There lived at that time at Walton-on-Thames, the daughter of the Earl of Tankerville; her favourite flower was the common Pansy, and a large portion of her garden was devoted to them. By giving them good cultivation, and selecting the best seed each year, some remarkably fine blooms were obtained. Other florists then took it in hand, with the result shown in Fig. 2, and with perseverance, it has now reached that state of perfection to be ranked among the best of florists' flowers.

The Fancy Pansy is of Belgian origin, and was first brought from France about the year 1858, by Mr. Andrew Henderson, of the Wellington Road Nurseries, London; who, finding that he could not grow them satisfactorily owing to the climate, offered them to Mr. William Dean, then at Shipley, now residing at Walsall. He showed them to some of his florist friends, and they called them rubbish, and ridiculed him for growing them. Nothing daunted, he continued to raise seedlings, and sent out the first English raised seedling, Princess Alice, a white self, with an immense blotch, at that time considered good: other seedlings were soon after sent out by the same raiser—Her Majesty, Harlequin, Attraction, King of Italy, Impératrice Eugénie (Fig. 3), Prince of Wales, and other varieties.

Other florists then took kindly to it, the first, I

believe, being Mr. John Laing, then residing at Dysart. Mr. John Downie, who at first was a strong opposer of it, afterwards commenced its cultivation, and I am sure we owe him many thanks, for by his careful attention to it he has been one of the chief instruments to bring it to its now almost state of perfection.

Although it was first taken in hand in England, the Scotch nurserymen are now doing the most for it; in raising new varieties there is great credit due to them, for the last few years they have sent out a great quantity of high-class sorts. Perhaps some of my readers will by this time be asking themselves the question, "What is the difference between a Show and a Fancy Pansy?" The chief difference is "the blotch." A Show Pansy (Fig. 1) has a small blotch, a Fancy Pansy (Fig. 4) a large one, the larger the better. The Show Pansy is divided into three distinct classes, viz., white-grounds, yellow-grounds, and selfs. A white-ground is a Pansy with the three lower petals white or cream, the outer edge surrounded by a belt of darker colour, either broad or narrow according to the variety. A yellow-ground differs from the white-ground in the ground colour only, which is yellow, instead of white. The top petals in both varieties are selfs, that is, of one colour throughout, and should be exactly the same shade as the belt. Purple, maroon, chocolate, puce, plum, bronze, violet, etc., are among the chief colours, with which the white and yellow-grounds are belted. A self is a Pansy of one colour only, "the blotch and eye excepted." Selfs are of various colours and shades—black, maroon, purple, puce, plum, blue, yellow, primrose, white, etc. In very dark selfs no blotch is discernible.

I will now give the points or properties of Pansies, also illustrations of a Show and Fancy variety. The Show variety, it should be said, has a white ground. On looking at the illustrations, the reader will see the different parts of the flower, and the names of them.

Properties of Show Pansies.—Form.—The outline should be a perfect circle, and free of every notch, serrature, or unevenness, the petals lying close and evenly on each other.

Texture.—The petals should be thick, and of a rich glossy, velvety appearance.

Colour.—In all two-coloured flowers the ground colour (of whatever shade) should be perfectly alike in all the three lower petals, and should be circular, and of equal width between the blotch and the belt in the three lower petals.

Belting.—The belt or margin should be exactly the same shade as the two top petals, and whether broad or narrow, should be of equal breadth throughout, without running into, or flushing with the ground colour.

Blotch.—The blotch should be dense and solid, and of circular character, free from all running into or through the ground colour or the eye.

Eye.—This should be bright gold or orange, and solid, without mixing or running into the blotch, and should be exactly in the centre of the bloom.

Size.—The larger bloom (other properties being equal) should be the better, but no flower should be considered fit for competition under 1½ inch diameter.

Selfs.—Of whatever colour, should be of the same shade throughout, in yellow, white, blue, or any other shade; the denser the blotch the better.

Properties of Fancy Pansies.—These may be enumerated as being:—*First*, Form; *Second*, Texture; *Third*, Harmony of colour; *Fourth*, Smoothness; *Fifth*, Size.

Cultivation—Preparation of Soil.—Any ordinary garden soil will grow the Pansy, but if high-class blooms are wanted, the cultivator must have different soil from that which is usually found in gardens. My advice to all is, "If you are going to grow Pansies, grow them well;" don't be like a friend of mine, just stick them in the soil and leave them to take care of themselves, and expect a grand show of blooms, for if they are treated in like manner they will come short of expectation. To grow them for exhibition purposes, the following rules must be strictly observed.

The ground intended for the plants should be trenched two spits deep; this should be done in October or November, being careful to leave the best soil at the top, if any rank makes an appearance it should be taken out of the bed, or put in very deep, so as to be out of the reach of the roots of the plants; four feet wide will be enough for the bed, if made any wider the ground is often trod upon in reaching over to the middle plants. The ground when dug over will be three or four inches above the surrounding ground, about six inches of the top soil should be removed, and the same thickness of the following compost placed on the top of the bed. Three parts of good rotten turf, that obtained from old pastures being the best, two parts of leaf mould and one part of good rough sand, white or grey being the best—red sand should never be used, as it often contains iron, which is injurious to vegetable life. The whole should then be turned over and thoroughly mixed, at least half a dozen times will be necessary before all is well mixed together; at each turning look carefully for wireworms: these infest the turf, and are a great enemy to Pansy growers. If any large lumps remain, these should be broken, so as to make all of a medium roughness; care should be taken not to get the soil too fine, for when so, and wet weather sets in, the soil runs together and becomes sad. Some growers place the soil for the plants to grow in on the bed as soon as it is dug

over, others not until spring, or a short time before the plants are set out. I always stick to the latter plan, and the blooms I get from my plants so treated I should not be ashamed to show to any one—large in size, good in substance, and possess all the properties essential to a good exhibition flower.

Planting Out.—When is the best time to plant out Pansies? I have been often asked this question by professionals and amateurs. Pansy fanciers differ, some set out one time, some another. Many growers set them out in the beds on which they are intended to bloom in October, and let them stand out all winter, others early in March; but most fanciers agree that the end of March or beginning of April is the best, and I agree with them. They are then in most seasons free from severe frosts; yet there are exceptions when sharp frosts have appeared in April, but in most seasons they will be safe if planted out then.

We will suppose the intended grower has got his plants ready. He should have a broad board to kneel on while planting; I mention this because I do not like to see anyone treading on ground intended for his plants. If the board be laid across the bed, the planter can kneel on it, and the soil will not be saddened by treading. The plants should be set in rows a foot apart and about nine inches between each plant; this will leave plenty of room to peg down shoots. All plants before set out should be held head downwards for a few seconds in a pail containing soft soap and water of the following proportions—two ounces of the former to one gallon of the latter; this prevents greenfly for a time (which are a great pest to Pansy growers) from taking up their quarters on the plants. If plants are received by rail or post, it is the best plan to put them on plates or other vessels containing lukewarm water, leaving them for a couple of hours to freshen them up, for when they have come a long journey they often flag for want of moisture. If the plants are grown in the cultivator's garden he will do well to take them up with a portion of soil adhering to them, if done carefully they will never flag from being removed. One often finds very long plants among his stock, and the common practice is to just place the roots in the ground, and leave the long top sticking out. Now the right way is just the opposite; bury all the plant except a couple of inches of the top, not straight down, but in a slanting direction thus. When plants are left a long way out of the ground they are liable to be twisted round and be broken off by rough winds, for remember that high winds do more damage to plants than frost. When set they should receive a good watering; early morning or late at night are the best times to do it. If the sun is hot they should be shaded for at least a week, otherwise they will wither, and often die. All shoots should be pegged down to the ground to prevent winds from blowing them about it; it will also make young growths appear.

Culture in Pots.—Plants intended to be grown in pots should be struck from cuttings in July or August. When rooted plant in 4 inch pots, with a few crocks at the bottom; then place in a cold frame, using the same kind of soil as for plants in the beds; plunge the pots up to the rims in ashes or cocoanut fibre; plenty of air should be given, not forgetting to water when required; keep in the frame until the end of March or beginning of April, giving plenty of air on warm days; then shift into 8 inch pots, and plunge in ashes or fibre as before; keep close for a few days, then admit air gradually. These pots are large enough for the plants to bloom in. All plants should have short sticks placed to them, and the shoots tied carefully to the sticks. I have obtained splendid exhibition blooms from plants grown in pots.

Propagation by Cuttings.—Propagation may take place any time from April to the end of October, although August and September are the best months for doing so. The young shoots that spring from the base of the plants make the best cuttings, those that have flowered have generally hollow stems; these do not root so freely, and should never be put in as cuttings unless the variety is extra good or scarce. All cuttings should be cut off just below a joint with a sharp knife. The soil intended for them should be fine, and a good supply of rough sand thoroughly mixed with it. Sand is absolutely necessary, as few will strike root without it. The propagator will do well to place some sandy soil round the base of the plants, also cover all naked stems that are pegged down: the young shoots will root into it, and save the trouble and time of striking after they are separated from the plants. No cuttings of unhealthy plants should be put in, as these seldom do any good. The hardier kinds can be wintered successfully in the open at the back of a north wall, or any shady nook in the garden, remembering never to put any under trees, as the drip will surely rot them, and all will be labour in vain. The best kinds should be wintered in cold frames, labelling each variety as it is set. Good labels, indeed the best I have ever used, can be obtained from Mr. H. Bradley, Label Manufacturer, *Halam*, near *Southwell*. These will last for several seasons, as they are dipped in a special solution to prevent decay. Some write the names of each kind on the labels, others use numbers only, and keep a book with the names in and the numbers opposite. I always have two books for the purpose, for fear of losing or mislaying one. With a little practice the names can soon be remembered by just looking at the

numbers. I seldom look at my book, unless I have got some new varieties and have not thoroughly mastered the numbers. Cuttings should be taken every season, as the best blooms are always obtained on the young plants. If allowed to remain several seasons without being removed, the blooms become small and altogether out of character, and will sadly disappoint the grower.

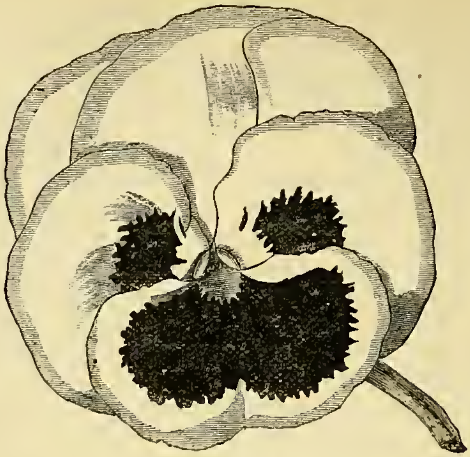


FIG. 3.—IMPERATRICE EUGENIE.
Seedling Pansy raised by Dean.

Propagation by Seeds.—Raising from seed is quite an interesting operation. I raise many hundreds every year, and must own that I often get excited over it. Of course all new kinds are raised in this way, but I can assure the reader that it is an awful job to get a real good one fit to name; there is nearly always something the matter with them—either a stripy eye, no substance, bad form, or other fault. But should the raiser (if he be a beginner) get a real good one, his joy knows no bounds. Seed that is intended for sowing should be gathered from the best flowers (only)—those that combine, form, substance, size, and good decided colours. It should be gathered just before it is ripe, otherwise the pods burst and the seed is lost; for in hot weather the pods burst suddenly, and the seed is scattered in all directions. As soon as gathered it should be put in envelopes, sealed down, and put in the sun to fully ripen. When ripe they should be sown at once, if a display of bloom is wanted for spring; if for summer and autumn blooming, sow in April. Seed intended for a spring display of flowers should be sown in boxes, using good light soil; the same as used for the plants will do very well. If the soil is damp at the time of sowing, and kept in a shady place, no water will be required until the seedlings make their appearance above ground; if dry, water with a fine-rosed watering-can at the time of sowing. As frosty weather approaches the boxes containing the seedlings should be placed in a cold frame or other slight protection; for if the winter is severe many of them will be killed, as some have weaker constitutions than others. In the beginning of April transplant into beds, and give the same treatment as plants already mentioned.

Enemies.—The chief enemies of the Pansy are slugs, wireworm, millepedes, and greenfly. There are many ways of destroying slugs. I have seen zinc gutters sunk into the ground all round the bed, and filled with salt and water. Of course no slug would ever attempt to cross this barrier, for most certainly it would prove the river of death. The only objection I have to the zinc gutters is the expense; many would not pay the amount charged for them. Another remedy against the slug is new-slacked lime (cold). This should be put in a muslin bag and knocked gently on a stick all over the beds and plants (not when in bloom), after dark, in damp weather, as they are then out feeding; the lime falls on them, and as they crawl about they come in contact with more, and death is certain, as the caustic which the lime contains burns their tender bodies. Pieces of cabbage leaves, carrots, potatoes, and other vegetable matter, may be laid on different parts of the bed, and looked over on the under side night and morning. Hundreds may be killed in this way. Wireworms generally eat the stalks of the plants under ground. The best way to catch them is to place pieces of potatoes (with the eyes cut out to prevent growing) just under the soil at the root of the plants, and examine them every day. Millepedes are worms of a darkish colour, about half an inch in length, with an enormous number of legs, and about the thickness of a piece of fine string. These are far more plentiful than wireworms. I have

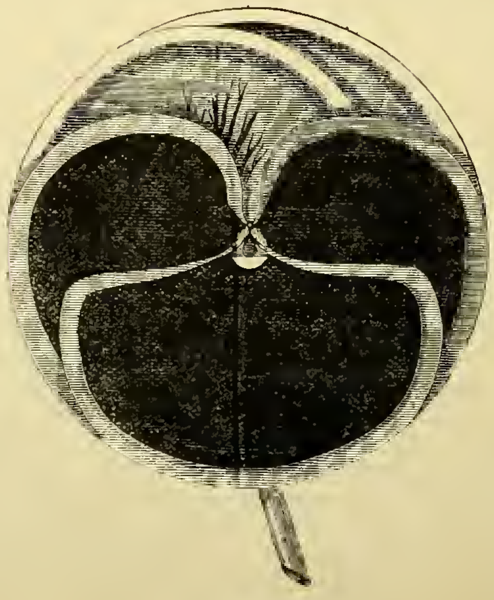


FIG. 4.—MODERN FANCY PANSY.

counted as many as thirty at one root. They may be easily known, as they often curl themselves up in a spiral form when the earth is removed from them. These can be caught the same as wireworms. Greenfly breed at such a tremendous rate that it is necessary to look the plants over every two or three days; for if they are allowed to become numerous it will be found a difficult task to entirely eradicate them. The most effectual way is a good watering with soft soap and water—about two ounces to the gallon of water, dissolve in hot water, and add cold to make up the quantity. None should be used when the plants are in bloom, or it will completely spoil them. Mildew often makes an appearance on the leaves and stalks of the plants. This can soon be killed by dusting powdered sulphur all over them.

(*To be continued.*)

LITHOGRAPHY FOR AMATEURS.

By H. E. Grantham.

I.—THE PRESS AND PRINTING MATERIALS, ETC.

As many requests have been made from time to time for instructions on this subject, I have pleasure in offering a few suggestions, and trust that my readers may benefit therefrom. I would earnestly recommend that the press and all materials required should be obtained from some well-known firm, who have a reputation to keep and will only send out really good materials, for although it is quite possible for an amateur to turn out good work with good materials, it is quite impossible for any one to do so with poor or indifferent things to work with. The following list contains nearly everything required; those that are sold by weight are priced at so much per lb.

	£	s.	d.
Lithographic Press, 12 inches by 18 inches, say	7	0	0
Leather Tympan, about 4s. per foot sq.			
Litho Stone, at 1d. per lb.			
11 inch Litho Roller and Leather Handles	0	14	0
1lb. Black Litho Ink, at 5s. or 6s.			
1 Quart Thin Litho Varnish, at 10s. a gallon	0	2	6
1 Quart Middle Litho Varnish, at 12s. a gallon	0	3	0
Quart Strong Litho Varnish, at 14s. a gallon	0	3	6
Ink Slab	0	3	0
Palette Knife, 1s. 3d.; Sponges and Damping Cloth, 3s.	0	4	3
1lb. Gum Arabic, at 1s.			
1 Bottle Nitric Acid, at 1s.			
1lb. Pumice Stone, at 6d.			
1lb. Grit, at 4d.			
Snakestone, 8d.			
Scraper for press, etc.			
A few sheets of soft paper and a few pasteboards.			
One stick Lemercier's Writing Ink, for transfers, about 1s. 6d. per stick.			

A few pens will also be wanted for writing, or a very fine brush properly cut for the purpose.

The total expense appears to be about £8 or £9—may be less if smaller quantities of the different varnishes can be obtained. The prices are only approximate, as different firms differ a little in their charges.

The Press.—Of presses for amateur use, I have personally had no experience, all my own work being done at the ordinary lithographic press as employed in printing offices for transferring, etc., etc. I can only remark that the pressure for lithographic printing must be either a "scraping" or a "rolling" pressure. There are firms who make small presses for amateurs, to secure on the top of a table, their chief drawback being that only very thin stones can be used; while the ordinary lithographic press, though costing about £7 for the smallest size, enables the printer to use stones that vary very much in thickness. From a price list I possess, I find that a press especially made for amateurs can be had at about £7 7s., which sum includes everything that will be required in ordinary use.

Lithographic Stones are sold by weight. They are a compact kind of limestone, and are imported from Germany. As sent by the dealer to his customers, the surface is not fit for the printer's use, and he has to prepare it, which is done by rubbing the smooth surface of the stone with pumice stone and water, or a soft stone called "second grit" (I prefer the latter, but it requires a plentiful supply of water, and, in fact, can scarcely be done properly except close to a water tap). After the second grit, a dark fine-grained stone called Water of Ayr stone, but more frequently spoken of as snakestone, is used until the stone is *polished.*

To Polish and Prepare the Stone for Work, take it to the sink or some equally convenient place, and place it on a piece of board lying across the sink; if the stone can be placed so that one end is under the tap, so much the better. Now drench the surface of the stone with water, and take a piece of second grit or pumice stone, place its edge on the surface of the stone and rub backwards and forwards, exerting most pressure when pushing from you, care being taken to

work evenly over the surface to prevent it rubbing hollow in the centre. If any old work is on the stone the use of the grit must be continued until the greasy portion has all been rubbed off; this will be shown by the stone no longer showing lighter in colour where the old work had been. Now wash the stone well, and take a piece of snakestone about four or six inches long, and use it in a similar way to the grit, pressing hard at first to rub out the scratches left by the grit, and afterwards lightly to *polish* it. Whether the stone has been polished sufficiently cannot be judged until the surface is dry. If it is required at once, stand it on its edge in front of the fire till dry; the surface should then appear quite smooth and *bright*, and also free from scratches, which show as white marks. If the stone does not reflect the light pretty freely, it is not sufficiently polished, and though the transfer may go down all right it will not print well without a great deal of trouble. The importance of thorough polishing is therefore great. The pieces of pumice, grit, and snakestone should be about six inches wide, so as to give a long edge for rubbing; there is then less risk of the stone wearing hollow: they should be held in both hands, and worked on the stone at an angle of about 45°, keeping the stone well wetted.

The Roller is composed of a wood stock, covered with a couple of layers of flannel, which is in its turn covered with leather. They are sold complete, but the printer has to prepare it for use, which is done as follows:—Hold the roller before a fire (not too close) in one hand, in the other take a "farthing dip" and rub the leather from end to end with the dip, and afterwards work the tallow well in with the hands: the object is to saturate the leather with a substance that will not dry as lithographic inks and varnishes do; it makes the roller much easier to keep in good condition. Having well worked the tallow in, the roller can be left till the following day, when the printer can open the tin of "strong varnish;" and first scraping the roller, by placing one end against his body and the other against anything convenient, and taking a pocket knife with a large *very* blunt blade in his right hand, the left holding the point of the knife to keep it steady, then, with the blade held at about right angles to the roller, he will *scrape* from one end to the other, *i.e.*, towards his body, pressing sufficiently hard to scrape well, but being careful not to cut the leather. The roller will always scrape smoother from one end than from the other; scrape the *smooth* way. Having finished the scraping, he takes out some of the strong varnish with a clean palette knife, and with the knife spreads it over the roller, passing the edge of the knife from one end to the other, the roller lying upon the ink slab, which may be either a very thin marble or litho stone, or perhaps a sheet of tin nailed on wood; the last is a very fair substitute for the marble or stone slabs. He now takes the leather handles, one in each hand, and inserts them over the roller handles, grasping them fairly firmly, and rolls the roller forward, and then back again He then lifts the roller off the slab, gives his wrist a turn forward, and repeats the rolling—this must be kept up for several minutes. Another way of "knocking up" the roller is to roll forward, lift off the slab and replace it close to the front edge of the slab, and so on.

The roller should be left for at least a week, kept well supplied with varnish, knocked well up at least once a day, and occasionally scraped when the varnish has got too "tacky," or looks dirty. When the roller no longer absorbs varnish it is ready for the next step. Open the tin of ink and get a bit out about the size of a walnut, and place it on the previously scraped ink slab. Then take the tin of thin varnish and punch two holes in the top, opposite to each other; by this means the varnish is kept clean, yet easily got out through the holes hy tilting the tin and allowing the varnish to flow out of the bottom hole; put some on the tip of the palette knife, as much as it will conveniently carry without running off; put the varnish thus obtained on the top of the bit of ink, and with the flat of the knife rub it well in till the ink and varnish are well mixed—then put the "pat" thus formed on the top part of the slab, scrape the roller, put some ink on with the knife, knock well up and leave to soak in, repeat with occasional scrapings for a few days, when, instead of mixing the ink with thin varnish, use "middle" litho varnish, and make the ink so stiff it will scarcely flow off the knife, even when held edgewise; put some on the roller, knock up, and it is ready for its maiden attempt at printing, which had better be a "heavy" solid job.

Gum Water is as necessary to the printer as stones or roller; it is used to protect work when it is left for any reason, by varnishing the surface of the stone with a sponge dipped into it, also for making the "etching" preparation; it is better to make the solution rather than buy it ready made. Put a quantity of gum arabic (sold at say 1s. per lb.) into a basin, pour water enough to fairly cover the gum, and leave till dissolved, stirring occasionally with a stick.

Nitric Acid is used with gum water for making the "etching preparation"; a few drops are poured into a teacupful of gum water, to which more water has been added to thin it. It is used with a brush, and its strength is easiest ascertained by dropping a little near the edge of the stone, and watching if it turns white after, say, a second's time; if so, it is about right. The nitric acid must be kept in a stoppered bottle, properly labelled.

Sponges, *Damping Cloth*, *etc.*, will about complete

all the tools used : a largeish sponge for damping the stone and other purposes, and small bits for gum sponges, for gumming the stones, etc., etc. The damping cloth is best made from old sugar bags, etc., though what is called "straining cloth" does very well; it is used in pieces about two or three feet square, and made into a "pad" by gathering the corners into the middle. It is used wet; if soaked in water and then wrung as dry as can conveniently be done, it will be quite wet enough.

(To be continued.)

ELECTRIC BELL INDICATORS.

By GEORGE EDWINSON.

IN my concluding article on "Electric Bells," in page 74, Vol. II., I promised to give some information on Electric Bell Indicators. The fulfilment of that promise has been long delayed by circumstances beyond my control, and the present article has been long on my programme of engagements for AMATEUR WORK. But everything comes to those who wait, and the waiting readers of AMATEUR WORK will now have their desires satisfied.

The necessity for a separate instrument to indicate whether an electric bell has been rung or not, or to show which bell has been rung, has led to the invention of several varieties of instruments for the purpose. These varieties may be classed under the following several heads :—

1. Indicators with electro-magnets only.
2. Indicators with permanent and electro-magnets.
3. Indicators with electric replacement.
4. Indicators with mechanical replacement.
5. Indicators with pendulum movements.

Of those, the first variety may be esteemed the best for all purposes, since those with permanent magnets are liable to get out of order from a loss of magnetism in the so-called permanent magnets. I therefore give my first attention to this variety ; but before doing so, it will be of some advantage to us to learn why such an instrument is required in an electric bell system, and what duty it has to perform. The necessity for its use appears when we have several rooms in a house placed in electric communication with one centre, as, for instance, a kitchen or a servants' hall. In a case of this kind we must have a set of bells with several different tones, to show by their several tones the rooms from which they were rung, or we must adopt a set of signals similar to those mentioned in page 74, Vol. II., or we must have recourse to an instrument which shall indicate the room from which the message has been sent. The first two systems above mentioned have been tried with similar results, viz., a confusion in the mind of the servant when two persons in two different rooms have sent signals simultaneously, and, an inability on the part of some persons to distinguish the tone of the bell. Hence an instrument has been devised to show plainly by means of words, letters, figures, or colour, the room from which the message has been sent, and such an instrument is placed in the electric bell circuit in such a manner as to act in unison with the bell. Several of tbose instruments are usually mounted on one board near the bell, and may be actuated by the same battery; but in special cases a separate battery and a relay is used for bell and indicator. This arrangement is advisable where the bell is used as an alarum, and indicators are placed to show the station or point from which the current was sent, as in the case of burglar alarums and fire alarums, for, by such means as these the proprietor of the bell can see at once the point of danger by referring to the indicator, whilst at the same time the bell will go on ringing, although the indicator battery has been cut or burnt out of circuit. The action of all electric indicators depends upon the well-known properties of an electric current traversing a wire wound around an iron core, to induce magnetism in that core whilst the current is passing through the wire. The magnetised iron is made to attract or repel an armature, and this in turn moves a metal disc, and indicates the passage of the current. When the armature is made of magnetised steel, it is called a permanent magnet, and when this is placed in close proximity to an electro-magnet, it is repelled from the electro-magnet only when a current is passing, and the direction of the repellant action can be controlled by the direction given to the current; thus if the current is made to pass in such a manner as to make the left-hand pole of the electro-magnet have a north magnetism, it will repel the north pole of the permanent magnet, and by changing the direction of the current the left-hand pole is made to receive south magnetism, and will attract the north pole of the permanent magnet. In this way indicators may be made to be replaced by electrical action, and turn to left or right as desired by a switch reversing the direction of the current. Indicators constructed on this principle are illustrated by Figs. 15—17.

The most simple and efficient forms, and most suitable to the skill of amateurs, are those belonging to Classes 1 and 4, namely, indicators with electro-magnets only, and with mechanical replacements. Such an instrument is shown in section by the sketch, Fig. 1, which shows a modification of an indicator sold by Messrs. John T. Gent and Co., Faraday

Works, *Leicester*, and is one, as modified here, which can be made by any amateur having an ordinary quantity of skill and tools. The details of manufacture are as follows: Procure a strip of brass or of wrought iron $5\frac{1}{2}$ inches in length by $\frac{3}{4}$ inch in breadth, and $\frac{1}{8}$ in thickness. Bend this to form three sides of an oblong figure 3 inches on the longer side, and $1\frac{1}{4}$ inch at both ends. The form of the strip is shown in Fig. 2,

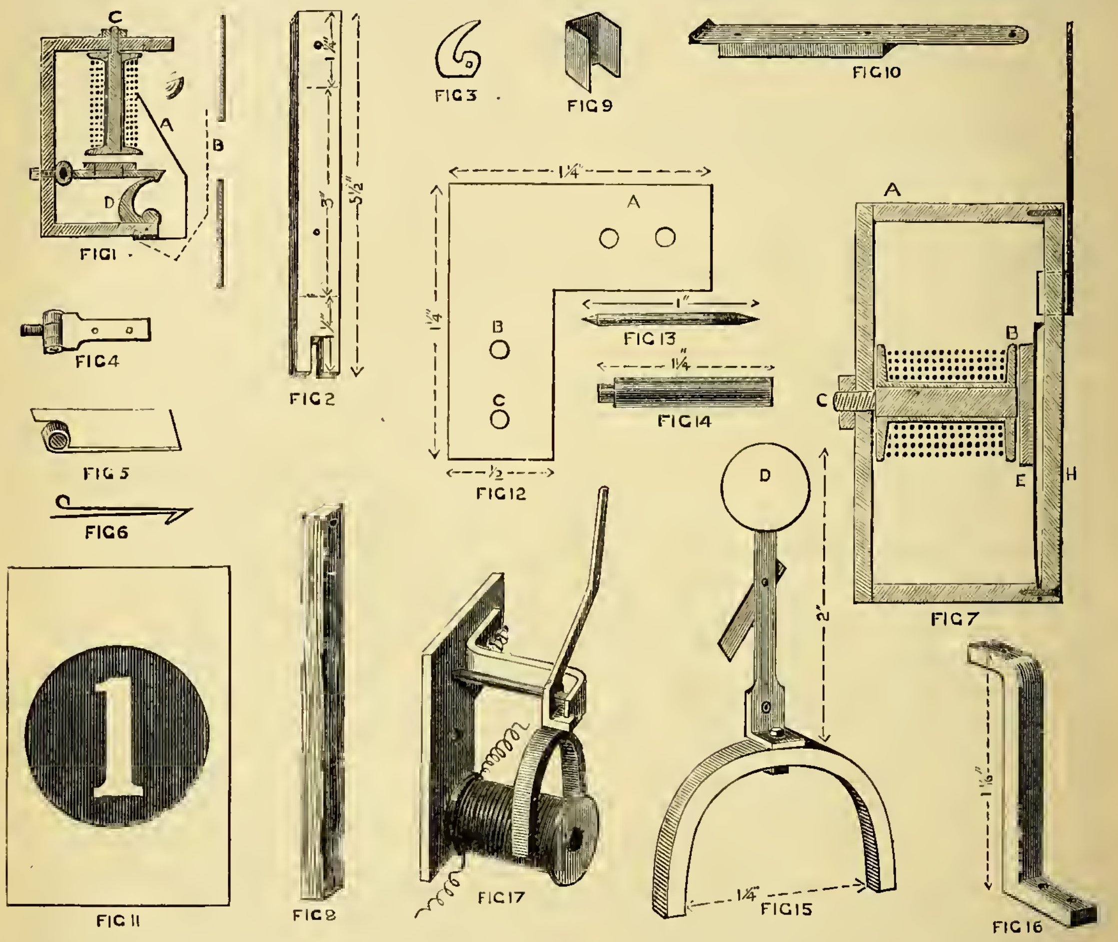


FIG. 1.—SECTION OF MECHANICAL REPLACEMENT INDICATOR. FIG. 2.—BASE OF INDICATOR. FIG. 3.—BRASS CAM. FIGS. 4, 5, 6.—SUGGESTIVE LEVERS. FIG. 7.—SECTION OF NEWMAN'S INDICATOR. FIGS. 8—11.—PARTS OF NEWMAN'S INDICATOR. FIGS. 12—17.—PARTS OF ELECTRICAL REPLACEMENT INDICATOR.

where the dotted lines indicate the position of the bends; it will be also seen that a hole is drilled through the upper part, another 1 inch from the bottom bend, and a slot is cut in the bottom part. These may be formed before the brass is bent; the use of the top hole is to hold the core of the electro-magnet, C, the other hole to hold the small eye bolt, E, and the slot to hold the cam, D. The core, C, is formed out of a piece of $\frac{3}{8}$ inch round iron rod, 2 inches in length. One end of this to the length of $\frac{3}{8}$ inch must be turned down to a diameter of $\frac{1}{4}$ inch, and screwed to receive a thin nut. This end will fit into a $\frac{1}{4}$ inch hole, drilled and tapped in the holder, as shown at C, and will thus hold the core in position for the bobbin of wire. This core could be riveted into its place, or it might be secured there with a drop of solder, but it will be best to screw it as I have directed, because it is most important that the bobbin holding the coil of wire should be fitted tightly on the core before the wire is wound upon it, and this could not be easily done if the core was first fixed in its place. When the core has been thus prepared, it must be softened, and this is best done by binding several such lengths together with a bundle of other scrap iron, heating the whole to a red heat, and allowing them to cool down in the fire, well banked up, for the space of twelve hours. We should therefore prepare several cores for this process, and anneal them to-

gether. The bobbin is best made out of boxwood or some other wood capable of being turned down thin. Length, $1\frac{1}{2}$ inch, diameter $\frac{5}{8}$ inch, bored to fit tight on core, and thinned down to $\frac{1}{16}$ inch thickness of body, if the wood will bear it, the idea being to get the coil of wire as near the core as possible without touching it. Mount the bobbin on the core, and wind on five layers of No. 26 silk-covered copper wire, each layer being wound on regularly as a reel of cotton is wound, allowing the two ends to stick out on each side to the length of 3 or 4 inches. The ends may now be secured with a bit of sealing wax, and the bobbin with its core (forming the magnet) mounted in the holder. We will next turn our attention to the armature and lever.

The small eye bolt, E, may be formed of a piece of stout brass wire bent to the shape of an eye, or it may be neatly shaped with a file out of a piece of brass, or turned in a lathe, and a hole for the pin bored in it afterwards. The lever also may be made out of a piece of brass wire bent with plyers to the required form suitable to a hinged lever, or it may be cut out of a strip of thin sheet brass. Suggestive forms and methods are shown by Figs. 4—6. A piece of soft iron (annealed with the cores) 1 inch by $\frac{1}{2}$ inch by $\frac{1}{8}$ inch must now be fitted to the upper side of the lever, and riveted to it with brass rivets, as shown at Fig. 1. If hard iron or iron rivets were used, the armature might acquire permanent magnetism sufficient to cause "sticking" and a consequent trouble in adjusting the indicator. If a piece of wire is used for the lever, and also if the amateur is able to use soldering tools, he may solder the armature to the lever, and thus avoid rivets. If the lower surface of the armature is first dressed with some wet "bluestone," and then tinned, it will take the solder perfectly.

The cam, D, Fig. 1, is cut out of thin sheet brass to the shape shown, Fig. 3, then soldered to a piece of tin bent to the form shown at A, Fig. 1, and is secured in the slot cut in the lower part of the holder by a pin, in such a manner as to allow free movement of the cam. Its size and the length of its tooth must depend upon the space left between the lever when placed in position and the base of the holder. The lever with its armature should hang horizontally beneath the end of the core, and the hooked end of the lever should rest on the tooth of the cam in such a position, and at such a distance from the core as to allow the armature sufficient movement to release the cam when pulled up by the magnet. To more clearly explain the action of this part of the instrument, it will be well to

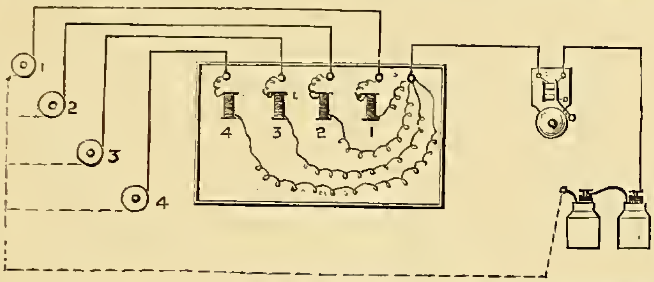


FIG. 20.—CONNECTION OF INDICATOR MOVEMENTS WITH PUSHES, BELL, AND BATTERY.

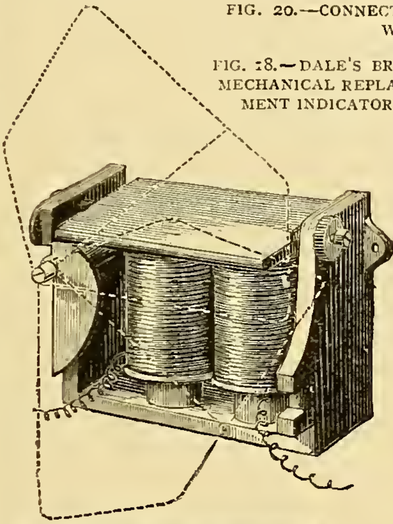


FIG. 18.—DALE'S BRITISH MECHANICAL REPLACEMENT INDICATOR.

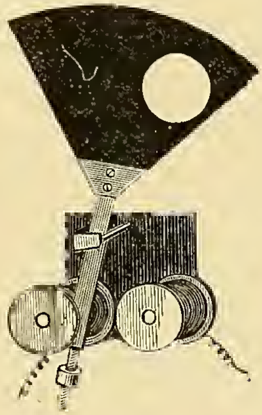


FIG. 19.—DALE'S ELECTRICAL REPLACEMENT INDICATOR.

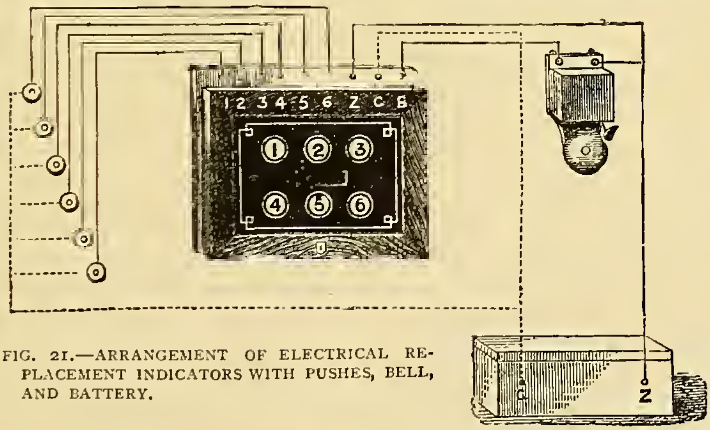


FIG. 21.—ARRANGEMENT OF ELECTRICAL REPLACEMENT INDICATORS WITH PUSHES, BELL, AND BATTERY.

here trace the whole action of the indicator. We will suppose that the indicator has been placed in its position in the case, and the wires of its magnet placed in circuit with the electric bell. The indicator plate will then occupy the position shown at A, Fig. 1, and will be held in that position by the hooked end of the lever engaging with the tooth of the cam, D, until the circuit has been closed; then the current will magnetise the core of C, this will attract the armature and disengage the lever from the cam, whilst the weight of the indicator plate will cause it to fall forwards into the position marked B, and thus show itself through the small window or slit in the indicator case. If the number or name of the room from which the current was sent, is painted with white letters on a red ground, or in red letters on a white ground on the indicator plate, the instrument will show at once from which room the bell has been rung. If special colours have been used to give the various rooms distinctive names, these may of course be shown by colour on the plate, and thus a message from the green room would show a green plate on the indicator. Nor would it be necessary to paint the plates, for a piece of coloured paper, or a piece of paper with number or name, pasted on the plate would fulfil all requirements. Still another and very usual practice is to write the names or numbers of the rooms over or under the openings in the cover of the indicator case, as shown at Fig. 21.

An ingenious form of indicator has been designed for Messrs. H. and E. J. Dale by Mr. A. Newman, and is here shown in section at Fig. 7. As will be seen from a reference to this figure, the instrument is most simple in its construction and certain in action. The frame, A, may be made out of a piece of $\frac{1}{2}$ inch and $\frac{1}{8}$ inch brass of the size shown. The core, C, turned out of $\frac{3}{16}$ inch soft iron and fitted with the bobbin, B, filled with No. 26 or 28 silk-covered copper wire. The armature, E, is attached to a strip of thin sheet brass (shown more fully at Fig. 10), and this acts the double purpose of a spring and a stop for the sleeve of the indicator plate, this stop is ensured by bending the tip of the spring at right angles, as shown, or by inserting a short pin in the end of the spring. The spring of the armature is secured to the frame at the bottom by the same screw that holds the slide bar, H, in position; this slide bar is made of $\frac{1}{4}$ in. square brass bar filed true and smooth through its entire length. A sleeve of thin sheet brass (shown at Fig. 9) is made to loosely slide over this bar, and is then soldered to the back of the indicator plate, which is merely an oblong piece of thin tin, as shown at Fig. 11, and this is painted any colour desired. The action of this "Vertical Drop Indicator" is as follows: When the wires of the magnet are placed in circuit and the bell is rung, the magnet attracts the armature, E, and thus withdraws the stop which has acted as a support to the indicator plate, and this drops down in front of the opening in the indicator case, where it remains, to show that the bell has been rung.

Another form of indicator is shown at Fig. 18, which illustrates the "British Indicator," manufactured by Messrs. H. and E. J. Dale, 4, *Little Britain*, *E.C.* The instrument is made $\frac{1}{2}$ inch larger than the sketch, all parts being proportionate. The frame may be cast in iron or brass, or it may be formed of sheet iron or brass bent to the required form and filed up to shape. Two bobbins of wire with their respective cores are used in this form, and their wires are connected as in the manufacture of electric bells. The armature in this instrument (A) is made out of a piece of $\frac{1}{8}$ inch sheet iron, and balanced across, the ends of the magnets being hung at the ends on the points of two steel screws, shown respectively at S S, in such a manner as to cause the front part to tilt forward. The indicator plate is fastened to a cam, C, and this is hung on a pin screwed into the frame of the instrument. When the instrument is at rest, the plate is pushed up by hand into the position B, and the cam is then moved with it until the edge of the armature engages with a notch in the cam and locks it fast. The plate is thus held up until a current is passed through the instrument, when the magnets attract the back part of the armature, causing it to tilt backward and release the cam, and the plate then falls down in front of the opening in the case to position D.

All three of these forms of indicator are constructed to need a mechanical replacement; that is to say, it is necessary for the servants or the person who answer the bell to also replace the indicator plate by hand in readiness for the next signal. This may be most simply arranged by looping a length of stiff wire to the plate and allowing this to work through a hole beneath the case, or the replacement may be effected by means of levers acted on by a cord depending from the case. This may seem to some persons a troublesome duty, and they may be led to desire some electric contrivance to effect the replacement. Such contrivances have been invented, and are in use at the present time, but their performance is not always satisfactory, and neglect of duty is often excused by casting the blame on the instrument. On steamboats, yachts, and other sailing vessels, a mechanical lockfast replacement is the only one admissible, and it is also the best for general use.

The three varieties already described will illustrate Classes 1 and 4 on our list. We will now describe and illustrate those in Classes 2, 3, and 5, viz., Indicators with permanent and electro-magnets arranged to be replaced by electric contrivances, or

swing to and fro with a pendulum movement for several moments after the bell has been rung. Figs. 12 to 17 show the construction of an indicator fitted with an electro-magnet placed between the two poles of a horse-shoe permanent magnet. The horse-shoe magnet is formed of hard steel magnetised by passing a current of electricity from three Bunsen cells through a coil of No. 20 cotton-covered wire wound around the legs of the horse-shoe in three layers. This magnet is then to be attached to an arm of thin brass, as shown, Fig. 15, and suspended by the steel pin, Fig. 13, between the brass base, Fig. 12, and the end of the brass bracket, Fig. 16, as shown at Fig. 17. This bracket is attached by two small set screws to the base at A, Fig. 12. The hole, B, is bored for a screw to attach the instrument to the back of the case, and the hole, C, is to receive the end of the core, Fig. 14. This must be of $\frac{1}{4}$ inch soft iron rod, and over this, after it has been put into its place, must be fitted tightly, a boxwood bobbin, $1\frac{1}{4}$ inch by $\frac{3}{4}$ inch, filled with No. 22 silk-covered wire. The disc, D, Fig. 15, may be of tin or of cardboard painted red or white, as may be desired, and fixed to the brass arm by a small brass rivet. The small signal arm at the left of this figure is merely a strip of brass riveted to the arm to act as a balance in adjusting the instrument ; this balance ensures one of the legs of the horse-shoe being always brought to rest against the bobbin on one side after the signals have been sent. This class of instrument may be made to work entirely by electrical action. When a current is sent through the coils of the bell and through the coil of this instrument in one direction, one of the legs of the horse-shoe magnet will be attracted to the coil and the other leg repelled ; and when a current is sent through the indicator coil in the opposite direction the action is reversed, and the disc replaced out of sight until another signal is sent. The maker has therefore only to connect the coil of this instrument with another small battery of one cell, or to the bell battery in such a manner as to ensure the current passing through the coil in a reverse direction to that for ringing the bell, and connect this short line to a replacement stud as shown in diagram. Other forms of this instrument are made, some with single permanent bar magnets suspended between two electro-magnets as in Fig. 19 ; others with horse-shoe magnets hung lengthwise between the two legs of a horse-shoe electro-magnet.

Other forms of indicator depend in their action upon a pendulum movement hung between the legs of a horse-shoe electro-magnet or actuated by a magnet placed near the top of the pendulum. The pendulum is set in motion by the current which rings the bell, and continues to vibrate for several moments after the bell has ceased to ring. These do not require special replacement, but they do not give such satisfaction as those with mechanical replacement, first described.

Indicator movements are always enclosed in a shallow box or case of teak or mahogany highly polished and ornamented on the front and outside. The cover of this box is perforated with as many holes as there are movements inside, and the movements are made to indicate through those holes. An idea of their construction is given in the illustration, Fig. 21, but space cannot be spared for a detailed description even if such were necessary.

A method of connecting up a system of indicators and bells is shown by Fig. 20, and this will serve as a guide to an arrangement in most instances where these are required. In Fig. 21 the studs and figures are shown on the outside of the case, and the replacement stud A is shown as a separate push connected by wires with the instrument. In actual practice, however, all studs and binding screws must be enclosed with their distinctive numbers and letters under the cover of the instrument out of sight, and the replacement stud is fixed to the right hand side of the case. The arrangement here, is, as will be readily seen, one for electrical replacement instruments worked from the bell battery.

PHOTOGRAPHIC APPARATUS:

ITS PREPARATION AND CONSTRUCTION.

By J. POCOCK.

IV.—PORTABLE STANDS FOR CAMERAS.

THERE are so many different sorts of camera stands, each possessing its own peculiar advantages, that it is impossible to recommend any particular form beyond all others. Of those described in the following pages, I may mention that Fig. 29 is a firm and easily-made stand, but as it does not fold or close up in any way, it is not very portable, especially when made high. Fig. 30 is very good for walking or hill-climbing, as when closed, it forms a good stout alpenstock, shod with an iron point, but being rather long, it is not convenient for railway or carriage travelling. Fig. 31 is the most convenient form of stand I have ever used for general purposes ; it was, I believe, invented by Mr. Kennett ; it shuts up into a small compass, each leg, when closed, being little more than half the length that it is when opened out, and it is light and rigid, while as any leg can be shortened or extended as required, the camera may be raised, lowered, or tilted to either side, as far as necessary, even in confined situations, where there

would be no room to extend the legs of other forms of stand.

Fig. 32 is a modification of Fig. 29, and Fig. 33 is a folding stand more easily made than Fig. 31, but without all its advantages; and Fig. 34 is a very substantial and strong folding stand, suitable for supporting a heavy weight, such as a dark tent, though, of course, the same stand may be made in a lighter form to bear a camera only.

With regard to the height of a stand, it is best to have it high enough, when at its full height, to bring the centre of the focussing screen level with the operator's eyes, so that there need be no stooping to focus. Moreover, it is usually easy to make a stand lower by spreading the legs, but difficult to make it higher should it prove too low to clear some wall or palings. Hunting about for bricks upon which to support the legs of one's camera is not a satisfactory occupation.

As for the material to be used in the construction of a stand, ash is a good wood, but other woods will serve the purpose very well; for instance, of stands at the present time in my possession, one on the model of Fig. 29 is made of mahogany, one like Fig. 30 is made of ash, one like Fig. 31 (more frequently used than either of the others) is made of pine, and one like Fig. 34, of oak. This being the case, I shall leave my readers free to choose their own material, and proceed to describe the manufacture of the various stands figured in the illustrations.

Fig. 29 is simply made of three pieces of wood, each planed to a taper form, measuring $1\frac{3}{8}$ inch by $\frac{5}{8}$ inch at the top, and 1 inch by $\frac{5}{8}$ inch at the bottom. Each piece is then sawn down the middle for about two-thirds of its length, and a screw put through from side to side at the bottom of the saw-cut to prevent the wood from splitting further when the top ends are pulled apart. A ferule is also fitted to the bottom, and an iron spike driven in to hold the ground and keep the legs from slipping.

The stand illustrated by Fig. 30 is shown closed at A, in section at B, and one leg is shown open at C. For each leg take a piece of wood $1\frac{1}{2}$ inch by 1 inch, and plane two edges of one of the broad sides of each, so that they will form an angle of 120°, in order that the three pieces may fit together, as shown at B. Cut down an inch at the top and bottom, to, say, 1 inch in diameter at the top, and $\frac{5}{8}$ inch at the bottom, and fasten wire round these reduced parts, so as to bind the three pieces securely together, or they may be fastened together with glue, two layers of paper being inserted to make the separation easy. The three pieces are then to be planed up round and taper, as though they were one, and, when finished, they should taper from $4\frac{3}{4}$ inches circumference at the top to $2\frac{3}{4}$ inches at the bottom. The pieces must then be separated, and each piece sawn down the middle, the saw cut secured with a screw, and the lower ends protected with triangular ferules, or bound with wire and spiked, as described in the case of Fig. 29. A stout iron shoe should also be made for the bottom of the stand when closed—any blacksmith will make this for about sixpence—and two curtain rings, R, R, slipped on, will convert this stand into a most reliable alpenstock.

One leg of the stand, illustrated by Fig. 31, is shown closed at A, and open at B, and one of the top pieces and the lower piece are shown respectively at C and D. Each leg is composed of three pieces, each about $\frac{1}{2}$ inch to $\frac{3}{4}$ inch square, according to the height of the stand, but the two top pieces are slightly tapered, being rather wider at the bottom than at the top end; these pieces are rounded on their outer edges, and have a groove down the middle of their inner edges, as seen in C. Through a mortise cut in the top of the lower piece a brass plate is inserted (or a piece of stout brass wire put through will answer the same purpose, but not so well as the flat plate) to run in the grooves in the two upper pieces. The three pieces are now put together, and a brass band about $\frac{3}{4}$ of an inch wide put round them at D, a small screw being put through each side of the band into the outside pieces of the leg. The lower piece will now slide up and down between the two upper pieces, and it is only necessary to have some means of fixing it at any length to which it may be drawn out. This is done by another brass band, E, the edges of which are either soldered or riveted together, this band is of such a size that it will slide over the three pieces when the leg is closed to within a few inches of the larger lower end, where the tapering of the outside pieces prevents its sliding further; and thus the parts being pinched together, the centre piece is gripped and retained in the place to which it has been drawn out. Another brass band similar to E is seen at F, and when this band is slipped down towards E, the top ends of the leg can be drawn apart to fasten on the triangle, and the band, F, being then pushed up again as far as it will go, there will be no possibility of the leg coming away from the triangle, as sometimes happens with split legs, in which the natural spring of the wood is trusted to, occasionally vainly trusted, for keeping the legs in place.

The stand exhibited in Fig. 32, requires only a short description. Each leg consists of two pieces of either half round or rectangular section; they are fastened together by a ferule or shoe, at the lower end, and about one-third of the way down from the top a small rod of iron or hard wood, is hinged with a piece of wire on the inner side of one of them, a recess being cut for the reception of this connecting

bar when the legs are closed up; and on the inner side of the opposite piece a small nick is cut to take the other end of the rod when the legs are set up, as shown in the figure. The top ends of these legs are pinched in and held between the projecting cheeks of the triangle.

Each leg of the stand shown in Fig. 33, is made

The stand shown in Fig. 34, if made to support a heavy dark tent, may be made of oak, $\frac{7}{8}$ inch by $\frac{5}{8}$ inch rectangular section. This stand is shown closed in Fig. 34, and partly set up in Fig. 35. It will be seen that the upper pieces are hinged to the lower by means of a flat piece of brass about $\frac{1}{16}$ of an inch thick, put through a mortise cut in the lower piece

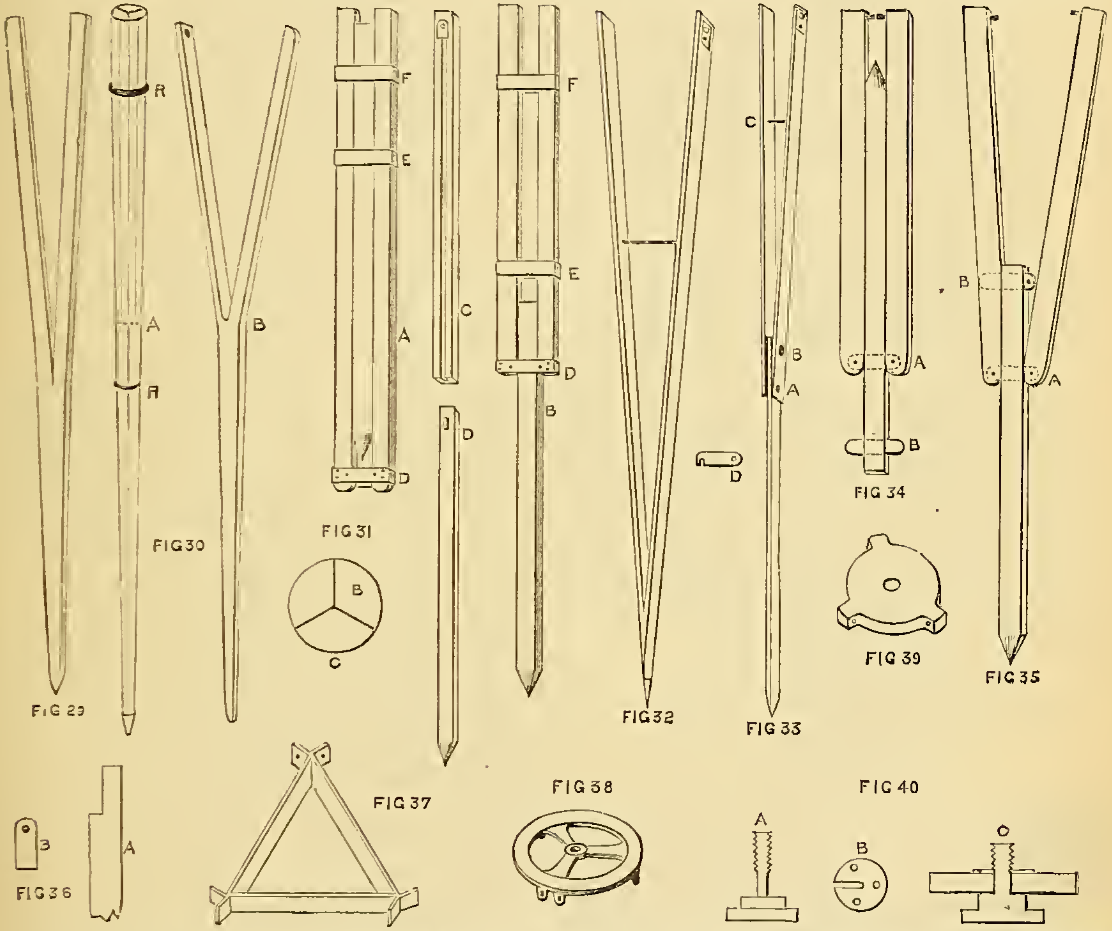


FIG. 29.—STAND, FIRM BUT NOT VERY PORTABLE. FIG. 30.—GOOD STAND FOR WALKING. FIG. 31.—STAND SUITABLE FOR GENERAL PURPOSES. FIG. 32.—MODIFICATION OF FIG. 29. FIG. 33.—STRONG FOLDING STAND. FIG. 34.—SUBSTANTIAL STAND FOR HEAVY WEIGHT. FIG. 35.—STAND IN FIG. 34 UNFOLDED. FIG. 36.—BRASS PLATE FOR LEGS OF STANDS. FIGS. 37, 38, 39.—TOPS FOR STANDS. FIG. 40.—ARRANGEMENT OF CAMERA SCREW.

of three pieces of similar dimensions to those used for stand, as per Fig. 31. A rivet or screw is put through the three pieces at A, and the lower piece turning upon this folds in between the top pieces. When the legs are to be set up, a thumb-screw is put through at B; a rod may be put across at C, and the tops pinched in between the projections, or the two upper pieces may be fastened together by a clip, such as that shown at D, in Fig. 33, and the projections on the triangle clasped between the tops of the legs.

of the leg. Another piece of flat brass, or of stout brass or iron wire, is to be put through in the same manner at B, a mortise being cut or a hole drilled in each of the top pieces to receive the ends of the brass or wire, when the leg is set up. The lower inside edges of the top pieces being slightly bevelled off, as is shown in the illustration, the tops set away from each other and are possessed of sufficient spring to keep them in place between the projections on the triangle.

Three forms of tops for the stands just described, are shown by Figs. 37, 38 and 39. The first two are made of iron, and must be bought; the third is made of wood.

A small brass plate, as at B, Fig. 36, bearing a pin or having a hole in it, must be fastened with screws to each of the top pieces of each leg, on the inside in Figs. 29, 30 and 31 (and in Fig. 33 also, if fastened with the brass clip), and on the outside in Figs. 32 and 34 (and Fig. 33, when made in the same form as that in Fig. 32). In the case of a heavy stand, such as is shown in Fig. 34, the brass plate is unnecessary, but an ordinary screw may be driven in and the head filed off, leaving the top of the screw for a pin.

When pins are put on the inside of the stands shown in Figs. 29 and 30, the wood must be cut away for the plate as shown at A, in Fig. 36, otherwise the parts will not close up together properly.

Also, if pins are used in the legs the projections on the top must, of course, have holes to correspond, and vice versa.

The wooden top shown in Fig. 39 is very suitable for the stands depicted in Figs. 31 and 33, and it is convenient to have the lower part of the camera screw turned down a little as shown by A, in Fig. 40, and it may then be fastened to the top by the plate shown at B. The whole arrangement is shown in section at C. The camera may be more quickly attached to the top, and there is no danger of the screw being lost, when this little arrangement is adopted.

(*To be continued.*)

HOW PERFUMES ARE MADE.

By JAMES WALSH.

AS many inquiries have been made on this subject in "Amateurs in Council," the following brief desciiption of the method followed in preparing perfumes may be useful to many readers. Perfumes may be obtained from sweet-scented plants by any of the following three methods :—

First, Distillation.—As this method requires the employment of a still, which would be out of the reach of many, I will merely remark that the essential oil, or otto of the plant acted on, rises with the steam, is condensed, and afterwards separated from the water, on which it floats, by decanting. Distillation is used only for strong perfumes, such as orange and lemon peel, geranium leaves, etc., and is useless for fine ones from flowers, such as violets, jasmine, etc. A handy amateur ought to be able to make a small still for himself.

Second, Enfleurage.—The delicate odours of flowers such as are mentioned above, or others, are best obtained by this method. Make a number of boxes or frames about 20 inches square by 3 inches deep, but without top or bottom. Such as would wish to try on a small scale may be satisfied with 10 inches square by 3 inches deep. Previous to screwing the four sides together, plough a groove in the centre of the boards, into which insert a sheet of thick glass. You have now a frame with a sheet of glass 1½ inches from either edge. These are called by the French *châssis*. Spread about ¼ inch thick of clarified lard, beef suet, or other pure fat, on each side of the glass. The *châssis*, or frames, are now placed one on top of another with the flowers between, which are allowed to remain two or three days, when they are replaced by fresh ones as long as they can be procured —say for one or two months. It will be observed that the space between two *châssis*, when placed one on the other, will be 3 inches, as edge of each is 1½ inch from the glass. When the flowers are being changed the grease should be scored with a knife, which causes the odour to be absorbed more readily. After the fat is thoroughly saturated with the perfume it may be scraped off, strained, and put into tins ready for the next operation. Moleskin, a thick cotton fabric, saturated with pure olive oil, is sometimes used instead of fat. The oil, after acquiring the perfume, must, however, be extracted by a hydraulic press.

Third, Maceration.—In this process the flowers and grease are placed in a *bain marie*, and kept heated over a quick fire. The boiling point is raised by adding salt to the water between the two vessels. The *bain marie* is made on the same principle as a glue pot, is used in culinary operations, and may be procured from most ironmongers. A handy person may, however, be able to adapt two vessels to this purpose on the principle just mentioned. Now we have the perfume in the grease, how is it to be separated, you will ask? Simply by cutting up in small pieces and infusing it in strong alcohol for about a month, then strain. The spirit now becomes the preserver and distributor of the odour, and the combination of the two is the perfume of commerce. The operation of the whole process is simply this The fragrant essential *oil* of the flowers or plants combines with the *fat*, for which it has an affinity. The *odorous essence* has an affinity for the *alcohol* and combines with *that*, leaving the *oil* remaining with the *fat*. The fat that remains is odourless, and may be converted into soap by the process described in recent issues of "our" journal. This, or any odourless soap, may be scented as follows : Slice it up *cold*, add sufficient perfume and beat the whole up in a mortar with a heavy pestle, or it may be dissolved in the *bain marie*, adding the perfume, of course. The

bain marie may also be utilized for clarifying the fat. The above separate or simple perfumes may be combined to form bouquets or nosegays, as for example, lavender water, which is made as follows: English oil of lavender, 2 ounces; essence of ambergris, 1 ounce; eau de Cologne, 1 pint; rectified spirit, 1 quart; mix.

Perfumes are also obtained from animals, as civet and musk, and from gum-resins, as camphor, myrrh, etc. Such readers as have gardens might utilize above information, and all could avail of the many exquisitely-scented wildflowers and plants obtainable in most localities in the country, and thus have a sweet memorial of their favourites after they had passed away.

MY FURNITURE, AND HOW I MADE IT.

By MARK MALLETT.

II.—MY WASHSTAND AND MY TOWEL-HORSE.

As a companion to the Pedestal Dressing-Table, given in my last article, we may now proceed to build the Pedestal Washstand, Fig. 9. Its general dimensions are much the same as those of the table—namely, 4 feet by 2 feet, and 2 feet 4 inches high. Many of the directions given for constructing the one will therefore be applicable to the other.

The ends and partitions which support the washstand are also to be of $\frac{3}{4}$ inch stuff, but as these pedestals are to be cupboards, and not, as before, nests of drawers, fewer ledgers will be necessary. In Fig. 10 is shown one of the partitions which come against the knee-hole. Of the three ledgers which cross it, the upper and lower, A and B, are of the $\frac{3}{4}$ inch stuff, but the smaller one, C, and the upright strip, D, are $\frac{1}{2}$ inch. The exact width of A is of little moment, since it has no uses beyond holding the partition together, and serving to receive the screws which fasten down the boards of the top. But B must be 3 inches wide, since upon this have to be screwed the $\frac{1}{2}$ inch boards which will form the floor of the cupboard; and this floor has to be $3\frac{1}{2}$ inches from the bottom, since that height will just bring it flush with the top of the strip which runs along the base of the wash-stand as shown in Fig. 9.

A foot above this comes the top of the ledger, C, which has to carry the boards of the shelf, also $\frac{1}{2}$ inch. The strip D is set an inch back from the front edge of the partition, an inch being the thickness of the door which is to shut against it. The opening of the doors will be seen in Fig. 9; it measures 21 by 13 inches. In one cupboard it will be desirable to divide this height by a shelf, as directed; in the other it may, perhaps, be more convenient to put no shelf.

The doors are of similar construction to those of the book-case, which were described in detail at page 457, Vol. I. But for the information of any reader who may not have that volume at hand, it may be well for me to explain that in this home-made furniture we do not attempt to follow the recognized method of making a panelled door. To do so would require skill and tools, which we cannot hope to have at our command. Our method of producing a somewhat similar effect is by clamping together two thicknesses of thin board with screws, the board being so disposed that the grain of one layer may cross that of the other. This plan is exceedingly simple, and but little skill is necessary to produce by means of it a strong and neat door.

Fig. 11 gives a vertical, and Fig. 12 a horizontal, section of one of these doors, on the larger scale (2 inches to the foot). The dotted lines at *a*, Fig. 11, show the original size of the upper cross-piece, which, in arching out the top of the panel, has been cut down to its present dimensions, the section being through the centre of the door. In Fig. 12 it will be observed that the pieces *b*, *b*, which form the sides of the panel, do not cross the grain of the inner boarding of the door. They are, in fact, of no constructive value, and are only placed where they are as being necessary to the appearance of the work; *c* and *d* in this cut are respectively the end of the washstand, and the partition towards the knee-hole seen in section; *e* is the strip against which the door shuts.

In Fig. 13 we have one of the doors of the washstand drawn on the larger scale (2 inches to the foot), and consequently with its details more clearly made out than in the perspective view.

The top of our washstand is to be made and covered in precisely the same manner as that of the dressing-table, only in this case a white or light marbled American leather cloth is to be preferred. One of the correspondents of AMATEUR WORK suggests that this series should include a design for a washstand with a marble top. In the opinion of the writer, however, marble would, in appearance as well as in reality, be too heavy for a piece of furniture built upon our present system; besides which, it would offer great difficulties to the amateur in the way of fixing. It will, therefore, be better to confine ourselves to the lighter, more tractable, and less costly material.

As shown in Fig. 9, the back of our washstand is fitted with glazed tiles—a good material for the purpose, as it is at once cleanly and decorative. Proper tiles are to be bought in great variety, and many of them are of really high artistic merit. The more ordinary sizes are 5 and 6 inches square. Messrs. Marks, Durlacher Bros., 395, *Oxford Street*, *London*, *W.*, sup-

ply such tiles, at prices varying from 3s. per doz. for plain white, to 21s. per doz. for the most elaborate patterns, and send their illustrated price list, and a sample tile gratis on application.

Fig. 14 is a section of back of the washstand intended to explain the manner in which the tiles are fixed. The *two* strips of wood above and below them are used to avoid working a rebate, for which the amateur is scarcely likely to be provided with a proper plane.

If anyone who makes this washstand should not care to go to the expense of tiles, or should object to their weight, he may fall back on an inexpensive but effective method of filling the space designed for them, and one which I have seen carried out with pleasing results. A series of coloured prints, such as those in the well-known children's books of Mr. Walter Crane or Mr. Caldecott, may be used. A shilling will buy a whole series of these, whilst, for that breadth of effect which makes them desirable for our purpose, and, indeed, often for genuine artistic merit, as well as humour, they surpass things of a hundred times their price. Indeed, one often wonders whether the children, for whom they are ostensibly drawn and published, can ever properly appreciate them. These pictures will want two or three good coats of varnish, that they may bear sponging when they get splashed and dirty, as they are sure to do. A single strip of wood above and below will serve to hold them in place; but short, upright strips should also be introduced between the different pictures, so as to give them the appearance of being each in a separate panel.

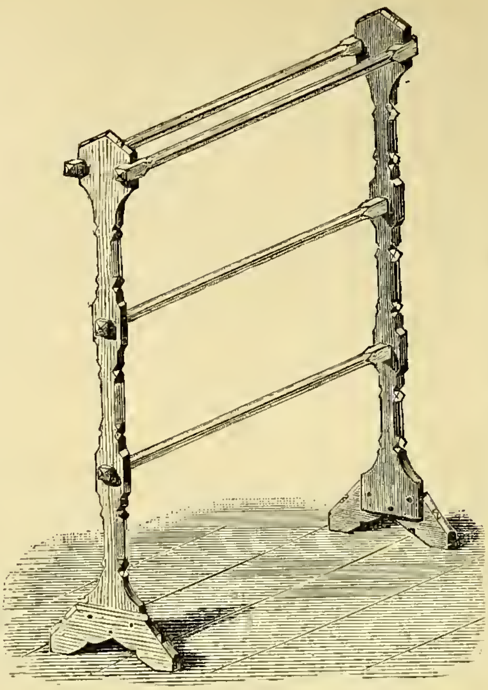


FIG. 16.—TOWEL-HORSE, COMPLETE.

Whilst I am speaking of such decorations as the above, I should wish to refer the reader to my remarks at page 460, Vol. I., on filling panels, such as those in the doors of this washstand, with various ornamental coverings. I there gave illustrations of a door panelled, with an imitation in French paper of embossed and gilded leather. In these present doors the inner layer of woodwork is shown in the illustration; but if the back is fitted with varnished pictures, there is no reason why others on a larger scale might not be used in the panels of the doors. It is a matter in which the workman may

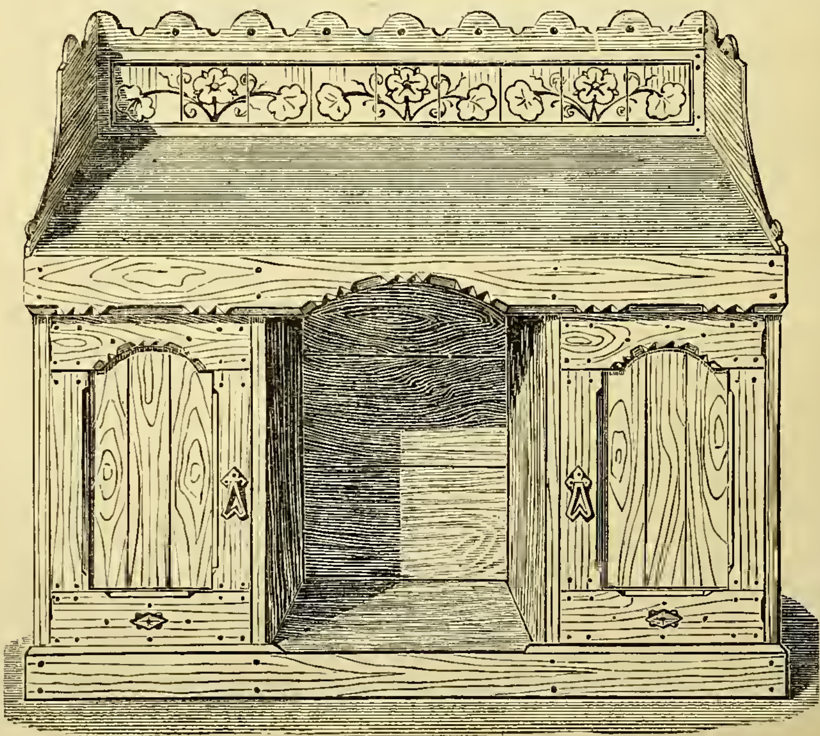


FIG. 9.—PEDESTAL WASHSTAND WITH RECESS BETWEEN PEDESTALS.

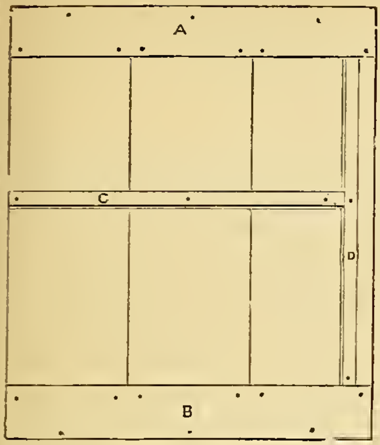


FIG. 10.—PARTITION IN WASH-STAND FORMING INNER SIDE OF CUPBOARD.

FIG. 11.—VERTICAL SECTION OF DOOR OF CUPBOARD.

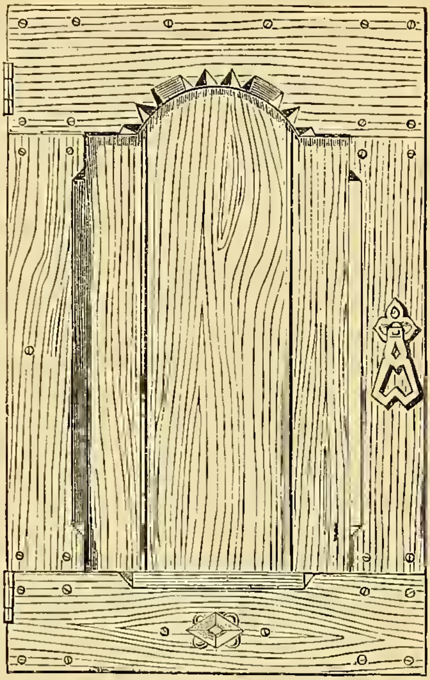


FIG. 13.—DOOR OF WASHSTAND.
On Scale of 2 inches to 1 foot.

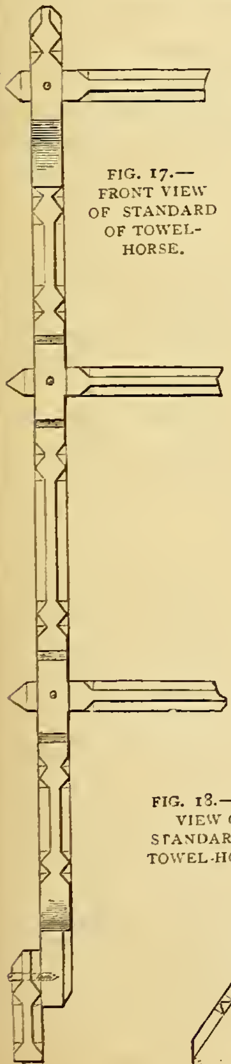


FIG. 17.—FRONT VIEW OF STANDARD OF TOWEL-HORSE.

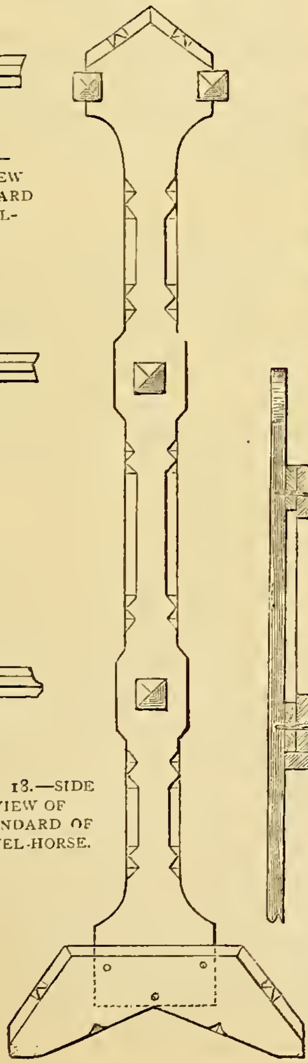


FIG. 18.—SIDE VIEW OF STANDARD OF TOWEL-HORSE.

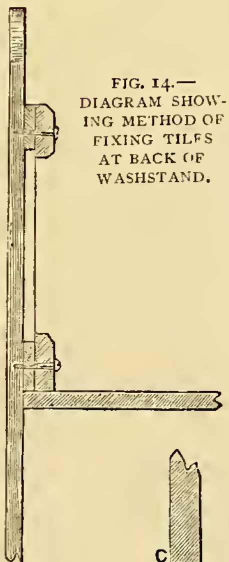


FIG. 14.—DIAGRAM SHOWING METHOD OF FIXING TILES AT BACK OF WASHSTAND.

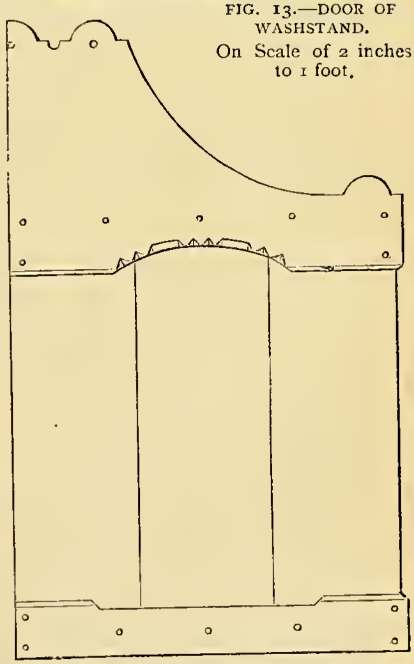


FIG. 15.—OUTER END OF WASHSTAND.

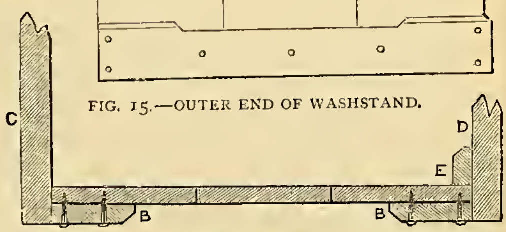


FIG. 12.—HORIZONTAL SECTION OF DOOR OF CUPBOARD.

be left to exercise his own taste. Fig. 15 shows the end of the washstand, and more particularly with a view to illustrating the shape of the piece of ½ inch board which forms its upper portion.

A necessary companion to the washstand will be a Towel-Horse, and to make one, which will not only be strong, but decorative also, will not be a matter of great difficulty. We have such a one roughly sketched in Fig. 16. The measurements are : total height, to the top, that is, to the top of each of the standards which carry the rails, 2 feet 9 inches ; total length, 2 feet 4 inches ; length of rails between the standards, 2 feet 1 inch.

In Figs. 17 and 18 we have side and front views of one of the standards, including portions of the rails, and the foot upon which it rests. The standard is cut from ¾ inch wood, is 2 feet 7½ inches long, and 4 inches wide. This width, from 4 inches below the top to within 4 inches of the bottom, has to be reduced to 2 inches, and this again in the spaces between the rails has to be still farther cut down to 1½ inches. In the narrow parts the edges are bevelled, as shown in the diagrams, a notch being cut to form a "nail-head," by way of decoration at each end of the bevel. The ends of the two lower rails will be seen to be brought through mortises in the standard, and there secured either by a peg or by a small screw. But the arrangement of the two upper rails is different. These are let half their thickness into the standard, and there fixed with screws. Brass screws should be used for this purpose, as also for securing the lower rails, if pegs are not employed, as iron screws, if they come in contact with damp towels, will be liable to ironmould them.

The rails are ¾ inch square. Their ends are finished off in a pyramidal form. A space of about 3 inches only at each end is to be left square, and throughout the remainder of their length their edges are to be bevelled off, as shown in the diagrams, so as to present an octagon in section.

The foot of the standard, which is in a separate piece, is also to be cut from ¾ inch stuff. It will need a piece 9 inches long by 3½ inches broad. It is to be clamped to the lower end of the standard, from both sides, by stout, round-headed, iron screws.

This will make a support strong and firm enough for all ordinary purposes : but, if preferred, a still stronger foot may be made by using inch wood, and letting the bottom of the standard into it to the depth of ¼ inch. A stronger, but more clumsy, horse may be made by using inch wood throughout for both standards and rails, but, if this is done, the effect will not be so satisfactory to the eye as it is when the design is carried out in the thinner material.

(*To be continued.*)

A CANVAS-COVERED SAILING CANOE.

A CONTRIBUTION FROM CALCUTTA.

By MATTHEW STICKLEBACK.

(*For Illustrations, see Folding Sheet issued with this Part.*)

IN the first volume of AMATEUR WORK there were several articles on Boat and Canoe Building, from the pen of Mr. Kennedy, but no description was given of a canvas-covered canoe, which is, I venture to think, rather more suited to the generality of amateurs, whose skill is often not sufficient for the nicety of work required on boats which are entirely wood built ; and I therefore propose to describe the construction of a Canvas-covered Sailing Canoe, for the benefit of those amateurs who are, like myself, too diffident of their skill to attempt Mr. Kennedy's more professional mode of construction.

The length, beam, and depth are points for every one to settle for himself; those taken for the following description are 16 feet, 2 feet 9 inches, and 9 inches respectively, and they give a canoe which is at the same time roomy and suitable for both sailing and paddling.

First, to any convenient scale, draw a line A B, Fig. 1, 16 feet long, to represent the kelson ; bisect this at C, and draw D C E perpendicular to A B through E, making D C and C E each equal to half the beam ; then draw arcs of circles passing through the points A, D, B, and A, E, B : this gives the deck plan. Now mark off on A B, equidistant on either side from C, and about 18 inches apart, the points 1, 2, 3, 4, and through these draw lines parallel to D C E to meet the arcs A, D, B, A, E, B : these give the positions of, and the correct beam at, each rib.

The next thing to be done is to make the ribs, Fig. 3, Nos. 1, 2, 3, and 4. The outside edges of these are to be ellipses, of which the major axis is the beam, as given for each by Fig. 1, and the semi-minor axis is the depth, *i.e.*, 9 inches in each case. The length in feet and inches of beam at each rib for this boat is marked on Fig. 1.

To draw an ellipse, draw two straight lines at right angles to each other to represent the axes ; then, on a straightedge, mark off the semi-major axis, $a\ b$, Fig. 2, and the semi-minor axis, $a\ c$, from the same point, a ; now lay the straightedge so that the point c is on one axis, and b is on the other, then the point a is a point on the ellipse. Repeat the operation all round at intervals, and you will get a succession of points on the ellipse through which the curve can be filled in by hand.

Draw out each rib full size on thick brown paper, and cut them out as patterns (only four patterns are

required for the eight ribs, as the corresponding numbers on either side are the same).

Rib No. 3, Fig. 3, is made solid, as it forms the end of the well. The top is sloped up so as to be 3 inches higher at the centre than at the sides, and at each shoulder a piece is cut out 2 inches by ½ inch, parallel with this sloped top, to receive the end of the gunwale piece, G, Figs. 4 and 5, which supports the deck on either side of the well. The notch at the top is 1 inch by 1 inch, to receive the end of the central deck support, D, Fig. 4. A 3 inch bottom piece is screwed on to this rib similar to those on ribs 1 and 2, which acts as a support for the ends of the bottom boards, O, Fig. 4.

Ribs Nos. 1 and 2 are each formed of three pieces of wood, with the grain as shown in diagrams, screwed together. No. 1 shows one side of a rib, No. 2 the other side. The two side-pieces are 2 inches wide at the curved portion and 3 inches at the bottom; the bottom piece 3 inches wide over the kelson. The tips of these two ribs are sloped up inwards to the same slope as the top of No. 3 rib, and then half an inch is cut off from the tip for the gunwale board, G. Rib No. 4 is made solid, somewhat similar to No. 3 rib. The centre is, however, only 2 inches above the sides, this being the height of the top of deck support, D, over the gunwale, E, at this rib. The recess, 2 inches wide and ½ inch deep, at the outside of this rib, for the gunwale piece, E, is made straight as shown in the figure, and not sloping as in No. 3. The notch at the top is 1 inch by 1 inch, as in No. 3. This rib has no bottom piece. In the centre of the bottom of each rib a notch, 1¼ inch wide and 1⅛ inch deep, is made to fit over the kelson, the latter being 1½ inch deep; this leaves ⅜ inch for the thickness of the laths which support the canvas.

The ribs are all made of ½ inch wood, finished thickness—that is to say, ½ inch after planing.

The ribs being all cut out and screwed up, we then turn our attention to the kelson. Get a piece of straight grained teak or similar wood, and dress it up to 16 feet long and 1¼ inch by 1½ inch; this forms the kelson, A, Figs. 4 and 5.

Cut out the stem and stern posts, B, Fig. 4, of tough ¾ inch wood (elm from the ends of packing cases is suitable), and fix them upright on to the kelson, placed on edge at either end, as shown, with two screws each. They should be 7⅝ inches high, so as to be level with the 9 inch line on the ribs. Taper the outer edge to ½ inch, and round off the stem as shown, leaving the stern square; taper the ends of the kelson also to ½ inch.

Now fix the kelson upright on a long bench, and we can begin to build up. Mark off on it from Fig. 1 the positions of the ribs, and on the side nearest the centre screw down, with one screw each, across the kelson, blocks of wood, 4 inches by 1 inch by 1 inch, C, Figs. 4 and 5, touching the mark for ribs No. 4, and exactly ½ inch clear for ribs Nos. 1, 2 and 3.

Stretch a thread taut fore and aft, exactly over the centre of the stem and stern posts, fastening it off to tacks driven into their tops; also stretch a *white* thread across each rib at the 9 inch line, and mark the centre exactly with ink. Now put rib No. 1 in position, with the 3 inch bottom piece against block C, and taking care that it is square with the top and side of the kelson, get the ink mark exactly under the fore and aft thread; this will ensure the rib being in proper trim; secure it in this position with a clamp, and then screw it up to the block, C, with one screw on each side. Fix all the ribs in the same way. Ribs Nos. 3 and 4 have a small diamond-shaped hole made in them at the centre of the 9 inch line, and in fixing them the fore and aft thread should be threaded through this and the rib adjusted by the ink mark on the cross string, as with Nos. 1 and 2. In every case where the rib has a bottom piece, this is placed up against the block, C.

Do not grudge any care taken at this stage, as everything depends on it; rather make all the ribs over again, if necessary, than let one be out of trim in the slightest degree, for if the centres are not all in line *exactly*, the canoe, when you get it launched, will always be trying to shoot round the corner, like the Irishman's gun.

When all the ribs are fixed to your satisfaction, put on the upper lath, 1 inch by ⅜ inch on each side, fixing it to the ribs with ¾ inch screws, bevelling off one edge of the ribs for it to be flat. The top of this lath should be level with the bottom of the recess cut in the shoulders of ribs Nos. 3 and 4, and with the outside tip of ribs Nos. 1 and 2, and ½ inch below the top of the stem and stern posts. The ends of all the laths must be shaved to fit close up to the two latter and then screwed down. When this is done the gunwale pieces, G, G, Figs. 4 and 5, are screwed down on to the tops of ribs Nos. 1 and 2, and into the recess in No. 3. This piece extends from 3 to 3 on each side, and is everywhere 2⅜ inches wide, finished breadth, and ½ inch thick; both sides are curved to follow the curve of the boat.

The recesses and tips of ribs being only 2 inches wide, the remaining ⅜ inch projects over and touches the top lath, which is bevelled off to let it come down flush, and the outside of G is made flush with the outside of this lath. This is plainly shown in section in Fig. 5.

On the further side of ribs Nos. 3, 3, screw blocks of wood 2 inches by 1 inch by 1 inch, R, Fig. 4, close up against the laths, and with their top edge level with

the top of the lath. At the same level and of the same section are the blocks, S, Fig. 4, fastened into the stem and stern posts. On to these and into the recesses in ribs Nos. 4, 4, are screwed the gunwale pieces, E E, Fig. 4, which are cut away at the ends to fit up against the stem and stern posts, and screwed into them too. This piece is of the same breadth and thickness as G, and similarly fitted as regards curving, etc., as G, but it is laid flat instead of being sloped up inwards. Do not fix this down permanently just yet. Wherever it is necessary to joint these two pieces they should be scarf-jointed over a rib.

Now turn the boat upside down and put on the rest of the laths, commencing at the kelson ; these are all 1 inch by $\frac{3}{8}$ inch, and should be screwed down to the ribs with $\frac{3}{4}$ inch screws, and should be about 1 inch apart, except for 6 inches or 7 inches on either side of the kelson, where they should be touching. As all the laths that are required at the centre (fourteen in this case) cannot be accommodated at the stem and stern posts, the remainder should be stopped at one rib or another, as they approach too close to one another. All the laths run as far as they go in a continuous line ; no one piece of a lath should be shorter than to come on to three consecutive ribs, and all joints should be over a rib.

Next cover the boat with best No. 3 canvas, commencing at the kelson, and stretching it as you proceed with a strong pair of pliers, fasten down the canvas to the laths with *copper* tacks ; don't fasten the canvas to the gunwale pieces yet.

Now get a piece of teak 16 feet by 4 inches by $1\frac{1}{4}$ inch. Leave the centre 3 feet full, 4 inches wide, and shave off one side to each end to $1\frac{1}{2}$ inch or 1 inch, and taper this rockered edge to $\frac{1}{2}$ inch thick equally on either side of the board ; apply the straightedge, which is full $1\frac{1}{4}$ inch thick, to the under side of the kelson, and screw it on to it firm and upright with screws from the inside. The stem end is rounded off as shown ; the stern left square, as shown in Fig. 6.

Turn the boat top upwards again, taking care not to bring any cross strain on to the keel, and fit into the four divisions, from stem and stern to ribs Nos. 3, 3, four airtight tin cases; these will form most reliable watertight bulkheads in case of an upset Then fit and fix the central deck support, D, Fig. 4 ; this is 1 inch by 1 inch, with the top edges shaved off, and forms the ridge of the deck ; it is screwed down into the notches into the tops of ribs Nos. 3 and 4, and the stem and stern posts (see Fig. 4). Strengthen these joints with brass angle pieces. Fix gunwale piece, F, permanently.

Now finish covering up the boat with canvas, fastening it to the outside edge of the gunwale pieces, and bringing it up over and fastening it to the top of D ; the edges are brought over rib No. 3, and fastened down on the inside of it (well side). Also bring the canvas over the gunwale pieces, G, and tack down to the inside edge of it ; it is also tacked to the front of stem and stern pieces. Cover the edge of the canvas all round the well with a strip of wood rising as a combing, $\frac{3}{4}$ inch above the deck all round the well, firmly screwed down ; also screw a plain strip with rounded edges all round the gunwale, to protect the canvas from wear, P, Fig. 5. This does not rise above the level of the deck.

The stem should be protected with a strip of brass, $\frac{1}{8}$ inch thick and $\frac{1}{2}$ inch wide, screwed into the stem post and round under the keel for some 4 or 5 inches ; this should have an eye in it for the stay which keeps down the bowsprit end, Fig. 6.

The stern should have a similar brass strip with two eyes for the hooks of the rudder.

The rudder and tiller are sufficiently explained by Fig. 7. They are all of $\frac{1}{2}$ inch wood, and the diagonal strip is given for strength ; there should be one on each side, riveted through with copper rivets on to washers. The hooks form part of the brass strip on the edge of the rudder ; the lower one should be longer than the upper for ease in shipping and unshipping.

Now make the shoe for the mast. This is of $\frac{1}{8}$ inch brass, of the form shown in Fig. 8, and is screwed on to the forward side of rib 2, and on to the kelson below it (see Fig. 4) ; a $\frac{3}{4}$ inch board, 3 inches wide, H, Fig. 4, is screwed to the under side of the gunwale pieces, G, G, close up to and in front of rib No. 2, with a semicircular hole on the after side of it to receive the mast, which is held upright in it by a brass strap and key fastened to the after edge.

A similar board I, Figs. 4, 5, is screwed on to G G at the centre of the boat, for the foot-steering apparatus; in the centre of this board drill a $\frac{1}{2}$ inch hole, and cover it top and bottom with a small brass plate, with a $\frac{3}{8}$ inch hole in the centre ; a similar $\frac{1}{2}$ inch hole, $\frac{1}{2}$ inch to $\frac{3}{4}$ inch deep, is made in the kelson immediately under this and covered with a similar plate.

Take a piece of wood, L, Figs. 4 and 5, 2 feet long, 2 inches wide, and 1 inch thick, and bore it in the centre with a $\frac{1}{2}$ inch hole, covered top and bottom with brass plate like the board I, and prepare the two pieces M and N ; they are 2 inches diameter where they touch L, and taper to 1 inch at the other, with a $\frac{1}{2}$ inch hole running through their length, which is such that with L on the flat they reach from the top of the kelson to the bottom of the board I, L being midway between the bottom boards and the gunwale. Place the three pieces in position as shown, and drop a $\frac{3}{8}$ inch pin through. To rig the

steering apparatus, the tiller ropes are brought forward over pulleys in the after corners of the well combing, and threaded through the two holes in the ends of L, when the pressure of the feet will turn the rudder; but this should be left till after the boat is launched.

The canoe is now ready for painting up. As the canvas by itself is not quite watertight, paint it all over with hot boiled linseed oil, and repeat the dose if necessary until it soaks well through the canvas. After giving this from twenty to thirty-six hours to dry, caulk with red lead all places where a leak can possibly be, *i.e.*, junction between canvas and keel, combing, and brass strips, and all joints in the canvas; then give the whole a couple of coats of paint—colour to taste. The inside and the combings can be either varnished or painted.

The bottom boards are made of ½ inch planks, fastened together by cross battens underneath. They stretch from side to side right up to the laths, resting on the top of the 3 inch bottom pieces of the ribs, with slots cut for the curved portion of the ribs to come through, and are made in as many pieces lengthways as are found convenient for taking in and out. A back board and cushions complete this portion of the arrangements.

The only things now left are the spars and sails. For the thickness of the former I am afraid I can give no advice; in this country you would use bamboos, which are no guide for ordinary wood masts.

The mast is 10 feet long and the bowsprit 1 foot 6 inches forward of the stem; all other dimensions of spars and sails are given in Fig. 6.

The mast fits into the shoe and the hole in the board H, as before described, and can thus be shipped and unshipped at will. If you want a removable bowsprit, screw down two brass shoes for it on to the forward part of D, through canvas and all, but it is easier and cheaper to simply screw the bowsprit itself down to D, and being so short it will not be found in the way.

For the main sheet, screw down a brass plate with an eye in it on to D, over rib No. 4 abaft the well. The sheet is formed with two single blocks, one fastened to the boom and the other to the brass eye, the running end being brought forward over a pulley in the after combing. The fore sheet, or perhaps I should say jib sheet, is double, and brought aft on either side through blocks on the thwart H.

Fix any number of cleats to the ribs and all available places near where you sit—they are never out of place—and bring all your ropes through blocks and pulleys to where they are within easy reach.

The pin of the foot-steering apparatus should be steel, brass, or iron, but all other metal work should be brass or copper, but if the expense is too great it can be, where not in actual contact with water, of iron well tarred. In tarring, heat the iron pretty nearly red hot, and then plunge it into hot tar; when this cools it does not come off and make a mess of one's fingers and clothes.

The advantages of this canoe are easiness of construction, cheapness and lightness, and the airtight tin bulkheads are perfectly reliable, being unaffected by any leak in the boat itself.

In conclusion, I may say that I have made a canoe on these lines, and it proved a great success. Mine I made only 10 feet long, as I found it difficult in the place where I was to get a piece of teak 16 feet long for the kelson. Even this smaller size has carried two men at a time with safety, and allowed of their bathing off it, which speaks well for its buoyancy, but as its shortness made the bows rise rather too high out of water, I would recommend a longer one being made.

The canoe, with the dimensions, sails, etc., I have described, was built by an officer in the Madras Infantry, at Rangoon, and described by him in the "Asian" in 1880; and as he then wrote for the information of amateurs in this country, I trust he will have no objection to my describing the style of construction for the benefit of amateurs at home. I have kept in all main details to his dimensions, only altering or adding such improvements as I found advantageous in building my own boat.

PRACTICAL SCENE-PAINTING FOR AMATEURS.

By HENRY L. BENWELL.

V.—EXPLANATION OF TECHNICAL TERMS—THE MIXING OF COLOURS.

TECHNICAL TERMS.—It may not be out of place to explain to the novice a few of the terms and phrases made use of by the profession inside a theatre, but which are seldom heard of outside its walls. As I shall make frequent mention of these words throughout my discourses on this art, a careful perusal of the following list will enable the student to grasp the meaning of my remarks more fully, whenever I may have occasion to make use of any word mentioned below. It frequently happens that several words given in this list are often found in the libretto of pantomime and burlesque pieces, and are consequently uttered by the actors. This I highly deprecate, as the majority of the audience fail to understand the meaning, especially if a pun is aimed at; and here a word of advice—to use a vulgar expression—never talk "shop" to outsiders. In my own private opinion it is unprofessional, and should be carefully avoided.

Act Drop.—A picture, or single painted surface of canvas, let down by way of a blind or curtain between the acts, so as to close up the proscenium opening.

Borders.—Also known as "hanging scenes" and "soffits." Borders are of three descriptions: interior, sky, and foliage borders. The interiors are painted to imitate ceilings or roofs of rooms, huts, etc.; the other two are used for exterior scenes. They are merely strips of painted canvas hung across the top of the stage to screen the space above.

Box Scenes.—Now generally used. Instead of the usual wings ranged one behind the other, as in the old method, there is a series of "flats" on each side, extending from the proscenium wing up to the back. The back part of the stage is likewise enclosed in this manner; the stage is thus completely enclosed on all three sides, the doors, windows, etc., being placed where required. By this means a more perfect representation of a room can be obtained, than where wings are employed. Known, also, as "enclosed chamber scenes." Such a scene as this, of course, represents the sides and further end of a room.

Backing.—A small "cloth" or piece of canvas placed behind where an opening occurs in the scenery at the back, such as French windows, double or folding doors, etc. This may be made to represent a conservatory, a street, verandah, or open country, according to requirements. If for interiors, a hall or ante-room may be shown. Where lattice windows are used, a good distant view of the country is very effective, if strongly lighted by ground lights.

Built Scenery.—Scenes that are built out on the stage, mostly of wood, and decorated by the artist to form part of his picture. They are generally strongly made. A bridge or mountain-path on which a number of actors could walk or stand at the same time, will illustrate my meaning. The balcony in "Romeo and Juliet" is a small piece of scenery of this description. The Lyceum is famous in this line of stagecraft.

"*Cloths.*"—These are the scenes which work up and down on rollers from the bottom, and known generally as "back scenes" or "rolling scenes;" in the painting-room they are invariably called "cloths." The scene at the extreme back is termed the "back cloth." There is a large number of "cloths" hung at various distances right up the stage in most provincial theatres, representing both interiors and exteriors, and suitable for almost any piece. In our London houses, however, where long runs are the rule, only scenes that are required in the play then running are kept on the stage. Known, also, as "drop scenes."

Cut Cloths.—Scenes with portions cut out after being painted on the frame. In exteriors they consist of woods, etc., with the spaces left between the trunks of trees and branches cut away. The foliage is also cut in places, which makes the scene very effective. Ruins, arches, etc., are also treated in this way.

Distemper, or Tempera.—All scene-painting is executed in distemper—that is, with colours mixed up with size and water. The ancient fresco painters made use of the white of eggs and other substances, which need not be mentioned here.

Flats.—Scenes, the canvas for which is strained upon framing; they are similar to side-wings, but much larger.

Sliding Flats are two broad frames, each half the width of the stage. They are worked on from either side, meeting each other and uniting in the centre. These are used when a practicable door or window is required in a scene which has closed in on the back scene, and where, for this reason, a drop scene is of no use. They can be used on any part of the stage, but are generally pushed on from the second entrance. In some pieces these would again be drawn off, bringing into view another set of flats, which would, perhaps, also be drawn off, and expose a fresh back "cloth," which has been set during the interval the two former were in use. "Flats" can, of course, be used also as back scenes; in fact, interiors consist mainly of these. Interiors are seldom painted on "cloths," excepting for corridors, passages, etc., where doors and windows are not required. Pantomime and burlesque interiors, such as kitchens, with all the different utensils painted in, attics and caves, are, as a rule, painted on "cloths." It is very effective when sliding flats suddenly and rapidly open and discover another scene behind, especially if the latter be a bright and sparkling picture.

Open Flats are similar to cut cloths, as they serve the same purpose. They are scenes cut out in places, so that both the background is seen, and the actors can pass through them. They are commonly used for groves, caves, forests, and open arches.

Flies.—The galleries running along each side of the stage, above the proscenium opening, and where all the ropes are fixed and worked in lowering and raising the drop-scenes, etc.

Fan Pieces.—Used in transformation scenes, and are worked on the fan principle, suddenly collapsing and discovering a fairy or a bevy of imps behind.

Ground Pieces, or Ground Rows.—Low pieces of profile running across the stage on the floor. They are generally used to mask a row of lights placed behind them (see Fig. 40).

Ground Lights.—A row of gas-jets connected by india-rubber tubing, placed on the floor behind the ground row to give a more brilliant light to the back-cloth.

Gas Battens.—The row of gas-jets overhead, and hung in between the borders, but somewhat higher.

Gas Wings or Ladders.—The side-lights fixed to uprights behind the side-wings.

Glazing.—Going over work already painted with transparent colours diluted with *strong* size.

"*Laying-in.*"—Vulgarly called by some "*slapping-in.*" This term is given to the first painting, and consists of putting in the middle or half-tints of the picture, using broad masses of colour of the required shades. Over this, the high lights and shades are afterwards put in.

Marking-up.—Making the outlines bolder, especially in the foreground, and should be done with strong size mixed with the proper pigments.

Medong or Mordant.—A cement used in fixing Dutch metal to the scenes. The receipt for making will be given in due course.

P. S. and O. P.—These letters signify respectively the Prompt Side and Opposite Prompt Side of the stage. They should be painted on the back of all side-wings, to indicate to the scene-shifter where to place them, in order that the scene, when set, will form a perfect picture. It is very essential that this item should not be overlooked, as the side-wings for the first grooves or entrance are painted more boldly than those immediately behind, and each succeeding pair should be painted more faintly, to give the appearance of distance. For example, the first pair of side-wings following behind proscenium wings, should have marked on the back $\frac{1}{\text{P S}}$ and $\frac{1}{\text{O P}}$, signifying *Prompt Side first grooves*, and *Opposite Prompt first grooves.* The next pair would be marked in the same way, but substituting the figure two for one, and so on for each succeeding pair. This method prevents the artist's intentions and ideas being thrown out when the scene comes to be set.

Profile.—Thin boards covered with a particular kind of canvas, to prevent them splitting. They are used for the edges of tree wings, rocks, ground rows, etc., and are sawn out by the carpenter in various shapes, according to the artist's outlines.

Practicable Scenes.—Those which contain doors, windows, fireplaces, cupboards, etc., capable of being worked and used. Any piece of scenery, such as coppers, bridges, porches, gates, stiles, etc., made sufficiently strong to be used by the actor, is known by the term "practicable."

Priming.—A composition of double size and gilder's whiting, a coating of which is applied to the canvas in a warm state. Also known as "*sheepskin.*"

Raking-Piece.—Similar to a set-piece. Small pieces of canvas and profile painted to imitate rocks, mossy slopes, banks, etc., and set on one side of the stage. They are sometimes made for the actor to recline or lie on. (See Fig. 39).

Rises and Sinks.—The scenes in this case are divided, but not like a pair of flats. They part horizontally—one part rising into the *flies* and the other part sinking through the stage to the *mazarine* below

Sizing.—New canvas is always given a coat of strong size as soon as strained. This and the "priming" is generally done by the labourer, hence he not unfrequently styles himself the "first artist" in the theatre.

Set Pieces.—Scenes placed obliquely on one side of the stage when it is required to show a cottage, corner of a house, or porch. They are also placed across the stage, just in front of the back cloth, such as palings, low walls, side of ship, bridges, etc.

Set Scenes.—These are very elaborate. Instead of the whole picture being painted on the back-cloth, the distance only is put in, the middle distance and foreground being composed of set-pieces, raking-pieces, and ground rows, with strong lights behind each. It requires great skill and experience to paint and arrange a set scene.

Stage Directions.—See Fig. 41, and reference thereto.

Scruto.—This is made of profile cut with a carpenter's cutting-gauge into laths of about an inch in width, the cut being made deep enough to penetrate the wood without cutting the canvas, which serves as an hinge. Its use will be described later on.

Trick Scenes.—These are used when an instantaneous change of scene is required, as in "A Romantic Idea," where ruins change into a lighted palace before the eyes of the audience.

Tableau Curtains.—Used in place of the act-drop. They open in the centre, and rise in graceful folds to each side and top of the proscenium.

Thin Colouring.—A process advantageously employed when it is required to give the effect of greater distance to any part of the scene, or to impart a hazy kind of appearance to a picture.

Wings, or Side Scenes.—These are merely scenes placed obliquely behind each other, on each side of the stage, to hide the view behind, and cover the entrances and exits of the actors.

Mixing of Colours.—The most difficult feature of painting in distemper is, that the colours dry so much lighter than they are when first put on, and many of them have, by gaslight, an entirely different appearance than they have in the daytime. Most colours dry several shades lighter than they are when wet; and, worse still, they do not all dry lighter in the same proportion; so that any person new to the work cannot estimate the particular shade of his paint when first laid on. It is, therefore, advisable for the artist to try his colours on a small scale at first, and dry them in front of the fire; he can then use better judgment when mixing up his pigments. To render

the colours opaque, a certain proportion of whiting or flake white is always mixed up with them, according to the shade required. Transparent and glazing colours being an exception to this rule—no whiting is used with them. The colours mixed with white dry much lighter than those in which no white is used. The strength of the size also makes a vast difference; very strong size having a tendency to darken the colours. As to the appearance of colours at night: French ultramarine, a bright blue by daylight, is a muddy purple by gaslight, and therefore unfit for distant tints, or for brightness. Verditer blue is best for distances: celestial blue is a good colour, but soon fades and becomes white in time. Yellow is much lighter by gaslight, and rose pink loses its brightness.

We will now proceed to prepare our colours ready for use, and the first thing to do is to procure several old jars, into which all powder colours are put, and water sufficient to make them in a pulpy state is then added. These are called the stock-pots. The colours are then taken from the stock-pots and put into the compartments on the palette, putting no more on the palette than is required for immediate use. In scene-painting many of the different shades are only

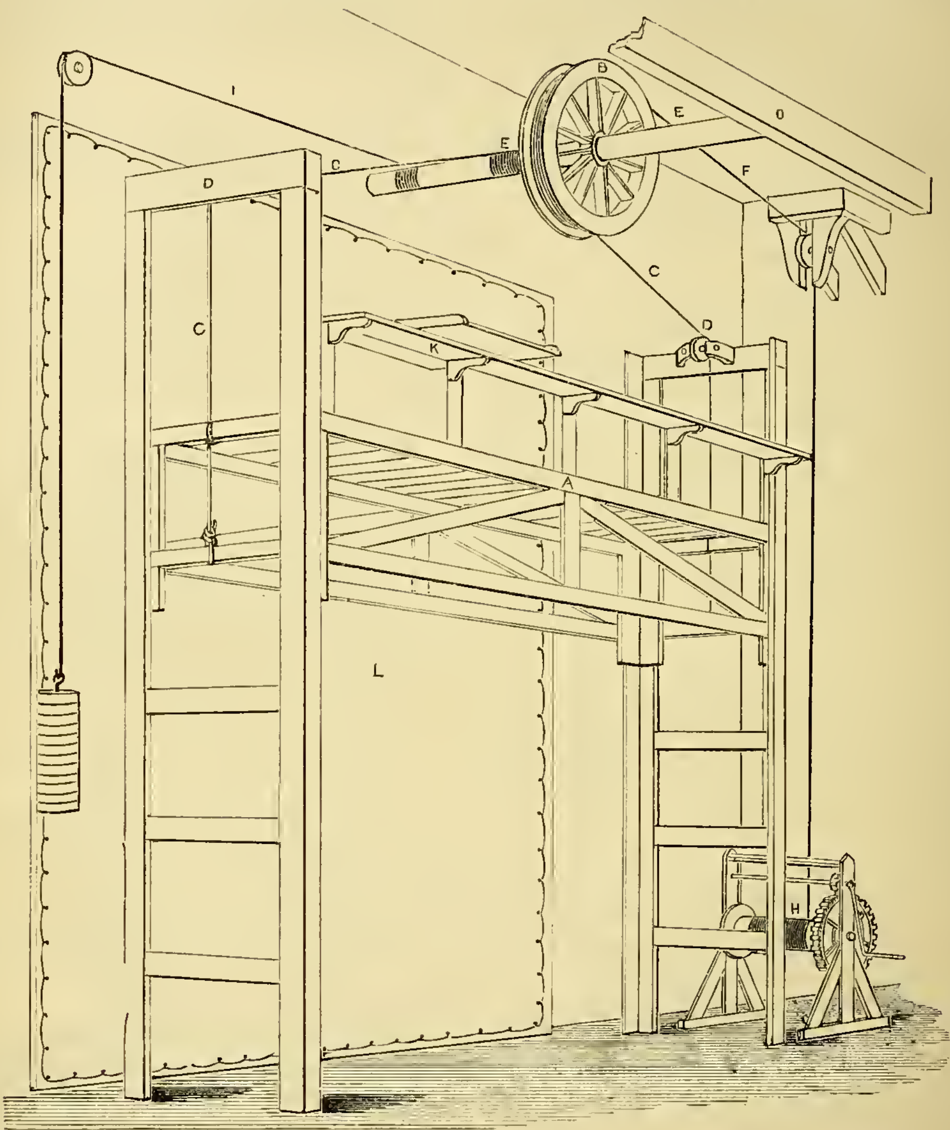


FIG. 33.—PAINTING BRIDGE USED IN SCENE-PAINTING. (*For description, see page* 242).

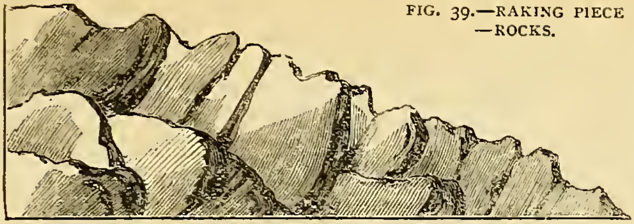


FIG. 39.—RAKING PIECE —ROCKS.

FIG. 40.—GROUND ROW.

obtained by mixing one colour with the other while on the palette. The way to do this is as follows: Suppose we wanted a purple, the artist would take up a clean brush and dip it in the size can, he would then transfer it quickly to the compartment on the palette containing the rose pink, and having got a good brushful of this colour, would spread it on the palette, he would then dip the brush in the ultramarine and mix this also with the rose pink, and to get it a shade or two lighter he would dip the brush in the whiting pan. Tints composed of three or four colours can be rapidly compounded in this way, adding more size as often as required to render them workable. Where a lot of colour is required, such as for skies, etc., the colours are mixed in pots, and to get the various tints, the painter dips his brush first in one pot and then in another, and in this way puts in a sky of perhaps half-a-dozen different hues. I shall now offer a few remarks on the best way of compounding several tints that are likely to be required for general use in the first stages of our work. For foliage, a good quiet general tint may be obtained by mixing Dutch pink with black, indigo, or blue ver-

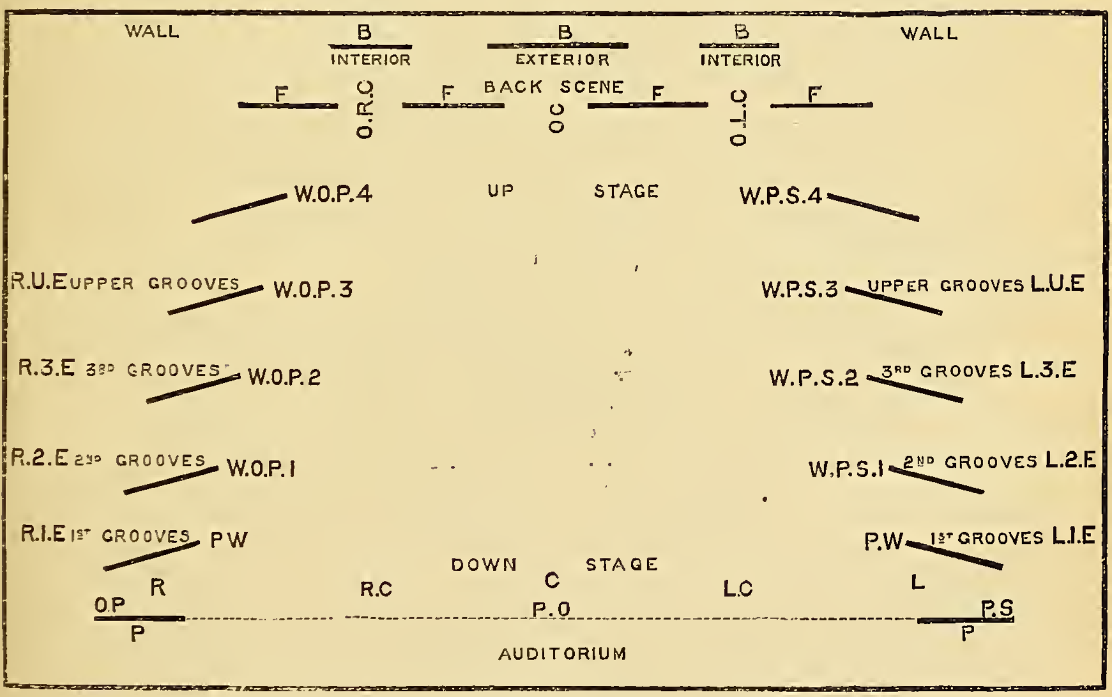


FIG. 41.—DIAGRAM EXHIBITING GROUND PLAN OF STAGE.

P.O., Proscenium Opening.
P., Proscenium.
P.W., Proscenium Wings.
O.P., Opposite Prompt.
P.S., Prompt Side.
C., Centre.
R.C., Right Centre.
R., Right.

R.1.E., Right First Entrance.
R.2.E., Right Second Entrance.
R.3.E., Right Third Entrance.
R.U.E., Right Upper Entrance.
O.R.C., Opening Right Centre.
O.C., Centre Opening.
L.C., Left Centre.
L., Left.

L.1.E., Left First Entrance.
L.2.E., Left Second Entrance.
L.3.E., Left Third Entrance.
L.U.E., Left Upper Entrance.
O.L.C., Opening Left Centre.
B.B.B., Backings, Exterior and Interiors as may be required.

W.P.S., 1, 2, 3, and 4, Wings and Prompt Side of the Stage.
W.O.P., 1, 2, 3, and 4, Wings Opposite Prompt Side of Stage.
F.F.F.F., Flats constituting Back Scene.

diter. Light ochre with green lake gives a rich green, which may be changed to a cool one by the addition of indigo. For skies use blue verditer and rose pink, or mix verditer, damp lake, and azure blue; also verditer, rose pink, and indigo. For sunset skies mix in separate pots the following: verditer and indigo; verditer and damp lake; damp lake and orange chrome. For clouds, mix verditer and orange red, or venetian red and azure blue; rose pink and azure blue. For cold grey clouds add a little black. For lights in the clouds, mix yellow ochre and rose pink, or yellow ochre and orange red. For distant foliage mix verditer and rose pink, or use Dutch pink by itself. For the sea, Dutch pink, verditer, indigo, raw sienna, azure blue, and emerald green, will be found most useful in making the various tints. For rocks some of the following tints will be found useful: indigo, burnt sienna, and rose pink; emerald green and black; vandyke brown and ultramarine; indigo, rose pink, and ochre. Black and venetian red make a good useful grey. A useful brown can be made by mixing brown ochre, venetian red, and black. For gold colours mix brown ochre and Dutch pink; Dutch pink and vandyke brown; Dutch pink and burnt sienna: these for laying in. For the lights, use flake white and lemon chrome, or flake white and orange chrome; orange and yellow chrome, chrome and Dutch pink. Purple and mauve tints are difficult to manipulate as, no matter how fresh and bright they may look in the daytime, by gaslight they assume a dirty and muddy appearance.

Mauve paste is a good colour to use, and purple tints for flat surfaces had better be avoided. The method of mixing these, however, will be given later on. For moonlight skies a good tint is verditer and indigo mixed. For the clouds add black and more indigo; and for lights on the clouds mix white and emerald green. Water is generally the colour of the sky, and the objects that are reflected therein, such as trees, banks, and rushes. It is therefore hardly possible to give any directions for mixing tints which would prove of any practical use. For branches and trunks of trees the following will be found useful: indigo, lake, and yellow ochre; burnt sienna and ultramarine; Dutch pink, burnt sienna, and indigo; and vandyke brown. For grass, use pure greens, mixing more or less Dutch pink or yellow chrome, for high lights. In painting dead leaves use chrome and burnt sienna. For earth, use yellow ochre; yellow ochre and venetian red; brown ochre; vandyke brown and brown lake; rose pink and ultramarine. For stone buildings, mix yellow ochre, umber, and indigo, or yellow ochre, red and celestial blue. For red bricks, venetian red should be used; and for shadows mix venetian red and ultramarine. In painting woodwork, use venetian red and indigo, brown ochre, burnt sienna, and ultramarine; marking out boards, etc., with yellow ochre. Where fire is reflected, use orange lead. For thatchwork, use Dutch pink, also Dutch pink and vandyke brown. All the tints previously mentioned have been mainly for painting exteriors.

(*To be continued.*)

THE ORNAMENTAL SLIDE-REST.

By JAMES LUKIN.

THIS, although it differs in detail considerably from that used by the metal-turner, is based on the same principle. There are the two slides at right angles to each other, but there is no quadrant plate, or turn-table, by which to vary the horizontal angle at which the tool is carried along the work.

The whole frame comprising the slides is fixed on a turned pivot, or tenon, exactly like that of an ordinary T-rest for hand-turning. The main or lower frame is therefore easily adjusted for operating upon conical as well as cylindrical work. This rest is in many respects easier than a metal-turning one to construct, but it needs, if possible, even greater accuracy in fitting, on account of the delicacy of the work it has to perform. At the same time in its simpler form it is a job quite within the power of a handy amateur, and a fair amount of dexterity in constructing it will ensure success.

The patterns, of wood, may be home-made, but as any lathe-maker, almost, will now supply castings, it will be the better plan to purchase them in the rough. The lower frame, with its tenon cast in one piece with it, will be like A and B, Figs. 1 and 2—the latter being a plan, the former a profile; Fig. 3 being an end view, showing it bevelled or chamfered as far as the line A B. Upon the filing up or planing of this main frame so much depends, that no trouble must be spared in the work. It will be fitted partly in the lathe, but chiefly by hand work at the bench, with file and scraper; and here let me beg the amateur not to ignore the latter tool or to neglect it on account of the difficulty—more imaginary than real—of using it. It is, I know, seldom used upon second class work; but then, on the other hand, much of that is done by milling, which insures a certain amount of accuracy quite sufficient for ordinary work. But it was by the file and scraper that such work was done, in old days, as raised the house of Holtzapffel to its well-earned position; and by the same means Whitworth established that reputation for accurate workmanship with which his name will always be allied. The amateur fails simply because he will not take time and trouble

in fitting together the various parts of his work; and it is worth any amount of patience to gain the kindred arts of filing and scraping surfaces. What, though at the works half-a-dozen rests may be made while the amateur is surfacing one frame alone. Time is an object in one case, and not in the other; while at the same time the main credit is, in the first instance, due to the machine, and in the latter to the workman. As it is quite possible that some of our readers may only be commencing to take in AMATEUR WORK with the new volume, I will repeat in as few words as possible the directions given in the last volume for filing up a true surface, as this will apply exactly to the present case. Supposing the casting of this lower frame to have been obtained, the first thing is to look it over and test its straightness in various directions with a steel rule or the blade of a square, so as to note where any special defects exist.

It is tolerably sure to be fairly true, but there are sometimes evident projections which have to be removed with a bastard file, with which also the frame is to be skinned, so as to get rid of scale and reduce it to a fairly even surface. During this process it is to be tested with the edge of the steel rule from time to time as the work proceeds. But there is one defect to be most jealously guarded against—viz., *winding*. The frame may be tested across at various points K, L, and appear satisfactory, and may yet be wholly untrue, being twisted, or as it is usually called "winding." To ascertain whether it is so two plain parallel strips of wood are used called winding strips. They are made thick enough to stand on edge, and are placed one at each end of the frame, at E F, in Fig. 2, and the eye lowered to catch at the same time the upper edge of both. If they coincide when so placed, and also when placed at various angles, and at other parts of the surface of the frame, the latter has escaped the defect alluded to. If not, it must be corrected until a uniformly level surface has been obtained. The surface-plate will ultimately carry this test to much greater accuracy, but this will suffice for the initiatory stages of the work.

The next operation will be to mount the frame between the lathe centres (see Fig. 2), putting on the slow speed and facing up the two ends. Drawing diagonals and a vertical line, as shown at C, the position of the centres will be defined; and where the lines cross, or at a spot set off on the vertical, the punch must be applied and centres drilled, which will also be the centres of the holes to receive the screw; it will be midway between A B, in Fig. 3, but may be above or below this line, generally about the position shown.

The pin of the driver chuck will come against the frame, and a carrier will not be needed. No difficulty will be experienced in facing the ends if a fixed tool is used in the slide-rest; and after it is done the too is to be withdrawn, and carried all along the frame, taking just enough of a cut to reduce it to accurate parallelism, and so secure the true position of the edges which have to be finished subsequently by filing. The finer the cut thus taken with the turning tool, the better. Do not omit the operation under the impression that it is unnecessary, as it also insures the squareness of the frame which is of vast importance.

The next job will be to turn the tenon which has to fit into the socket of the sole-plate. The top face of the frame having been already levelled, can be securely clamped to a face-plate, a centre being then made at the end of the tenon, into which to place the point of the back poppit. The tenon can now be turned and finished, as well as the under part of the frame, B C, of Fig. 1, from which it springs. Care must be taken not to get this tenon conical, and it should be well and finely finished. Attention must now be given to the bevelled part of the frame, which is the most difficult of all to true up to a good surface with hand tools alone. On the whole a three-square or half-round file is the best to use, with the tang bent like Fig. 4. Either shape will enable you to get into the angles. These are bent file handles, but the bent tang is quite as good, and I think firmer in use. Make two little metal winding strips to test the level as before, and an angle gauge to prove the work as you go on, and remember the motto, *Festina Lente*, slow and sure. Fine file both surfaces with great care, so as not to throw either out of truth. The surface-plate, if at hand, ought now to come into use.

It is the only means by which that perfect accuracy can be attained which is so essential to all ornamental lathe apparatus. A perfectly level plate of iron (or ground and roughened glass) is smeared very lightly with oil and ochre, or other colouring matter. The coat of this must be very thin, just enough to dirty the whole surface evenly. The frame is then to be laid upon it and slightly rubbed, and all high points will receive a portion of the colouring matter, and will thus be distinctly shown. At the first application only two or three such marks will appear, denoting the highest protuberances; but, as the work proceeds, and the test is from time to time repeated, the marks will increase in number until, finally, the whole surface will be found to be marked, or at any rate a large part of it, not here and there but generally. Each high part is at first filed down, but after a while the file will be too large a tool, and only by a scraper of some kind can the final touches be made. Of scrapers two kinds are used: one is a three-square file ground on each side to remove the teeth, leaving three keen and polished edges; the other is a flat file ground off in a similar way to remove the teeth, and then also

ground off quite square at the end. This is pushed forward at an angle to the work which is found on trial to cause it to cut freely, and the three-square one held tightly and used sideways. It will attack places that cannot be got at with the larger tool. A scratching action will not do.

The tool must really cut and scrape off little advantage of machinery, whether for planing or milling. There are, however, for hand-work in awkward places means not generally known to amateurs, especially the use of short bits of file, or files specially made, which do not appear to be in the market, but are confined to the trade. The amateur, however, can, if ingenious, easily make a tool to suit

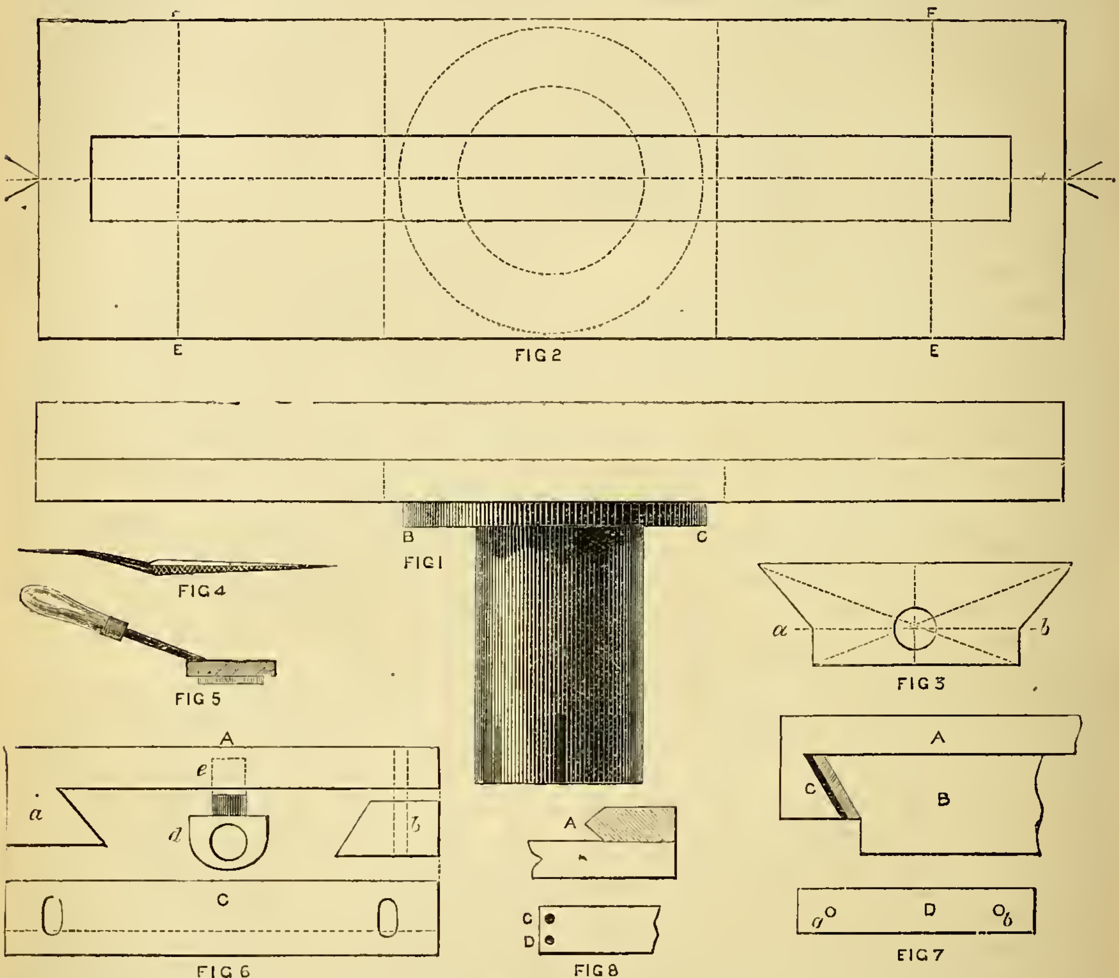
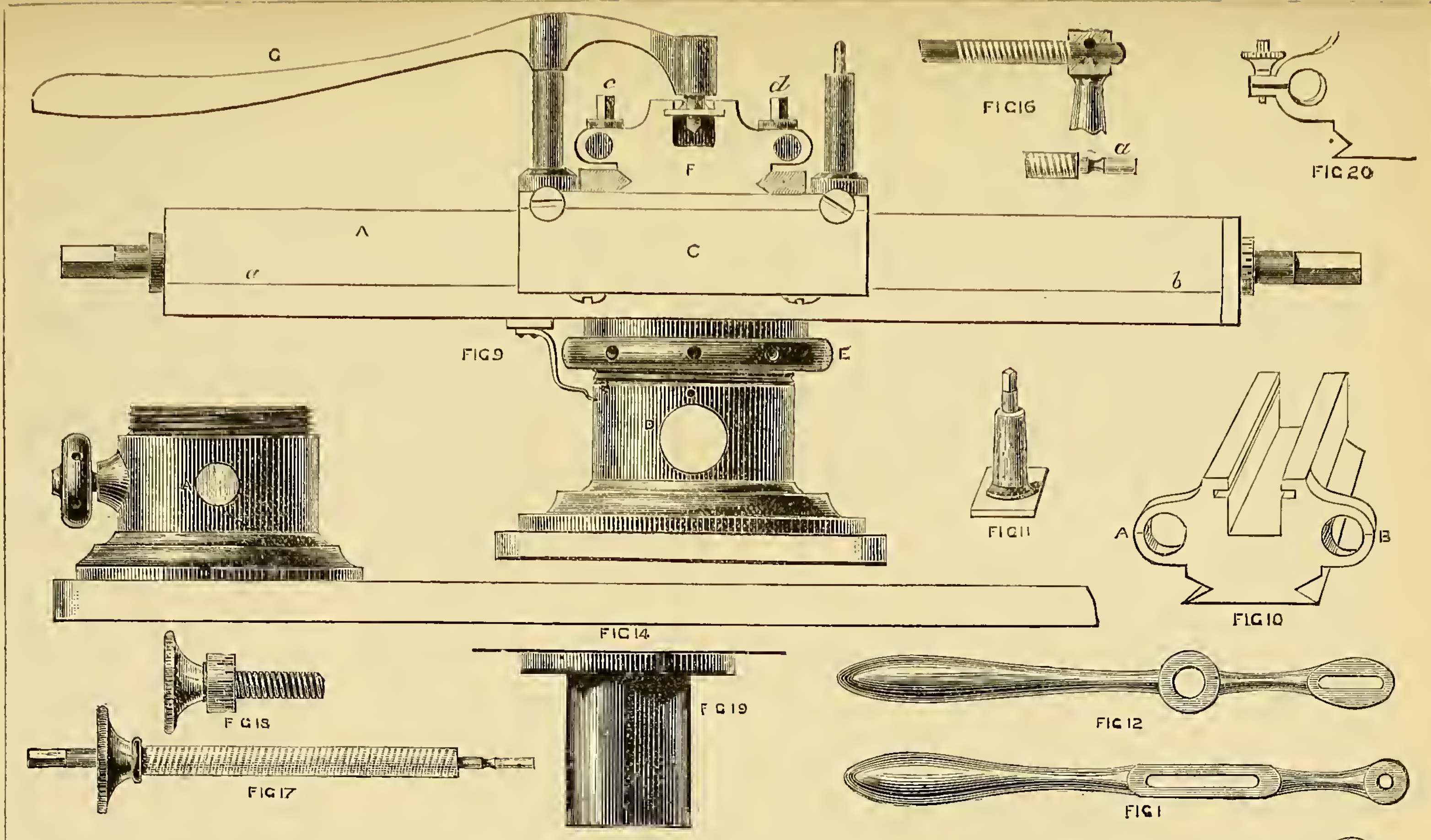


FIG. I.—PROFILE OF LOWER FRAME. FIG. 2.—PLAN OF LOWER FRAME. FIG. 3.—END VIEW OF LOWER FRAME. FIG. 4.—FILE WITH BENT TANG. FIG. 5.—SHORT SCRAPER. FIG. 6.—MAN PLATE FORMING FOUNDATION OF REST. FIG. 7.—METHOD OF FITTING GUIDE BARS. FIG. 8.—MODE SUGGESTED FOR FIXING SLIPS.

square patches. Do not be tempted to grind a flat face by rubbing the frame on the surface-plate, or you will assuredly spoil both, wearing one hollow and the other convex. On no account must a surface-plate be used for rubbing and grinding. The getting up of the under-side, where the frame is bevelled, is more difficult than similar work on the top, owing to the narrowness of these surfaces, and greater awkwardness of their position ; and here, of course, comes in the vast his needs. Fig. 5, for instance, represents a short bit of a flat or three-square file let into a bit of hardwood with a handle of stout rod screwed into it at an angle convenient for the purpose. A piece of file an inch or two in length will assist such a job as that in hand. A similar holder of brass, with a bit of rod soldered on for a handle, is still better. The brass may be chiselled out, and the file secured with pitch, or resin and brick dust as a cement.



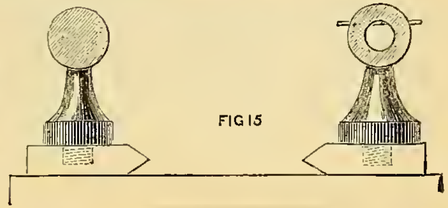


FIG. 9.—VIEW OF ORNAMENTAL SLIDE-REST, COMPLETE. FIG. 10.—PERSPECTIVE VIEW OF TOOL-HOLDER. FIG. 11.—TOOL-CLAMP. FIG. 12.—LEVER BY WHICH SLIDE IS MOVED TO AND FRO. FIG. 13.—ALTERNATIVE FORM OF LEVER. FIG. 14.—PROFILE OF REST-SOCKET SHOWN AT D IN FIG. 9. FIG. 15.—PINCHING SCREWS SHOWN IN DETAIL. FIG. 16.—DIAGRAM SHOWING SIMPLEST MODE OF MAKING PILLAR. FIG. 17.—FULL LENGTH VIEW OF UPPER SCREW. FIG. 18.—DIVIDED HEAD FOR STOP-SCREW. FIG. 19.—MODE OF FIXING MAIN FRAME OF REST. FIG. 20.—BEST FORM OF LUG WITH PINCHING SCREW.

The triangular scraper will also come into use in this case as you can get into all angles with it. A gauge is requisite, cut out of steel or iron plate, or even tin, wherewith to test the angle which the upper surface makes with the under part; but if the latter is worked truly flat and straight from end to end, and perfectly free from all suspicion of winding, the angle is of little importance, at least it will itself be equal from end to end of the frame.

As it will be necessary to hold the frame in the vice in various positions, lead or copper clamps are to be used, one pair being hollowed to take the stem or tenon, while the top face is being operated upon. It is probable the work upon the frame may seem tedious, but when this part is well finished, the grand difficulty is over, although somewhat similar work remains to be done upon the tool-slide or upper part of the rest. This is, however, shorter, and all the surfaces are less extensive, and consequently easier to work. These upper fittings commence with a solid block, as shown in Fig. 6, which forms a foundation for the rest. The V, or guide bar, A, is very often cast in one piece with the rest, but it is as well separate, as it can be then placed in a vice and filed up with ease and accuracy. The block is similar to, but less heavy than, that of a metal-turning rest, being only a flat plate $\frac{1}{2}$ inch to $\frac{3}{4}$ inch thick. But all will be correctly proportioned if castings are purchased. You have now to square up this piece first of all, but if you have a two-jaw chuck, or can turn out a shallow cup chuck of boxwood very truly level at the bottom of the recess, it is quite possible to turn both the flat sides true and quite parallel. I am an advocate for turning all that can be held in a satisfactory manner; but many who have lathes nevertheless prefer to use a file on a job of this kind, and if one guide is cast on, a file is the only tool that can be used. The advantage of a lathe is that parallelism of the flat sides is secured if only the work is well and fairly chucked. The work of filing, testing, and scraping is, of course, the same in this as in the previous case.

One or both of the chamfered bars, as B of this Fig., has to be now fitted to the lower part, and similar ones to the upper; but the latter, which stand in the other direction, are generally worked to a double chamfer, shown in section at A, Fig. 6, and in plan, with elongated holes to permit adjustment at C, of Fig. 4. These bars are usually of steel, and the plate is of gun-metal, as is also the recessed tool-slide to be presently described. Fig. 7 shows a mode of fitting guide-bars not very usual, but some American planers and rests are so made. Instead of accurately facing the inside of the bevel, a thin parallel plate of steel, D, of this Fig., is inserted between C and B. This is shown with diagonal shading near C, the black line representing the open space between the parts. Adjusting screws are tapped into C, in the direction of the dotted line, whose ends drop into recessed centres, A B, of D, holding up the steel slip, and bringing upon it the required pressure. C may also be grooved out so as to leave at the lower part a slight rebate on which the slip can rest. It appears an easier mode than having to file the awkwardly situated surface of C; but I doubt if it is so firm and satisfactory. The slip should be thick enough nearly to fill up the interval, so that the screws may only have to produce pressure, and force it firmly against the chamfered side of the frame. I think with four small screws bearing at top and bottom, like C, D, in Fig. 8, this plan might be safely adopted. Only in case of a very narrow slip of less than $\frac{1}{2}$ inch in width, would two screws, I think, suffice for its support and adjustment. Under the main plate, A, in Fig. 6, is shown the nut, a flat piece of brass $\frac{3}{8}$ inch thick to $\frac{1}{2}$ an inch, with a pin turned to fit tightly into the (dotted) hole, drilled under A. Put in thus it will adjust itself as regards the exact distance of the screwed hole from the under surface as soon as the leading screw is passed into it. If not absolutely the best way to attach the nut it is the easiest, and it is very commonly adopted. As measurement of the advance or traverse in either direction of the tool, is of absolute necessity in ornamental turning, it is essential to have a well-cut screw of, preferably, ten threads to the inch, and I strongly advise that the amateur get it done for him at a lathe-maker's, who will then also tap the nut. Its diameter should be about $\frac{7}{16}$ inch for a rest with a 6-inch frame, and $\frac{1}{2}$ inch for one of greater length. The strain upon it will be slight, because it has not to go through hard service like that of a metal turning slide-rest. An inspection of Fig. 9 will give a good idea of such a rest as it stands complete, except that two screws which are tapped into the lugs at each side of the tool-slide are omitted. The holes for these are shaded dark. A is the main frame chamfered to the line A B, C is the main slide already described, which carries two guide bars shaded diagonally with double chamfers, between which slides the toolholder F, with its channel for the shanks of tools, drill spindle eccentric cutter, etc.

I have added in Fig. 10 a perspective drawing of this tool-slide, showing the grooves into which fits the base of the tool clamp, shown in Fig. 11. There are two of these, but one has its clamping screw higher to take one hole of the lever, G, by which the slide is generally moved to and fro. This lever has one hole elongated into a slot, or there could be no advance of the tool-slide. Figs. 12 and 13 each give a plan view. The shape is no consequence, as a flat bar

with one slot and one hole shaped to something like a handle is often used. It is as well to make it of a neat form, however.

At the upper part of D, the rest socket, will be noticed a few threads of a fine screw. I have given a profile of this in Fig. 14. Upon the screw fits a gun-metal ring, by which fine adjustment is made of the height of the tool ; D is the usual clamping screw. The small screws C, D, of Fig. 9, above the tool-slide, are pinching screws, the lugs, as seen at L, being frequently sawn through, and drawn together by these screws, so as to take up wear when the two main screws work at all loose, as it is essential that they should work stiffly but smoothly in the tapped holes.

In the position of the tool-slide shown the stops or pillars against which the two main screws abut could not easily be drawn, without making them appear continuations of the pinching screws just spoken of, but in Fig. 15 I have drawn them in detail. One is simply a pillar or stop, and the screw abuts against it. This precludes further advance of the slide, and arrests the action of the tool, which is thus set to cut to a given depth only every time it is thrust forward by the lever. The right-hand screw, on the other hand, is so arranged as to advance and withdraw the slide without the lever coming into use, or in conjunction with it, and is very useful when delicate work is in progress, which might be damaged or spoilt by a too sudden advance of the tool by the lever alone. An arrangement is, however, made to detach this screw at pleasure, so as to render the tool-slide independent of its action.

There are two or three ways of effecting this. The simplest is to make the pillar similar to Figs. 15 and 16. The upper part is drilled to take the end of the screw which is turned to fit, and has also a groove turned in it, as shown in Fig. 16. A small taper-pin is then inserted in a hole drilled to receive it, and this pin, while it permits free revolution of the screw, retains it within its bearing, so that the slide will be advanced or withdrawn by the rotation of the screw.

Another plan is to screw the end, A, which projects beyond the pillar, and then to fit it with a nut and washer. This is more trouble, and the little nut is liable to be lost, as I know by experience. A fresh pin can be made under such circumstances in a few minutes. Fig. 17 gives a full length view of this right-hand screw, and the other, with the exception of the end, which is to be finished off squarely, is like it. The head may be made separately of gun-metal, and fastened with a pin. Both screws may, and the stop-screw *must*, have a divided head (as in Fig. 18), to read against a scratch on the front of the lug. Sometimes it is, however, made as a cylinder, and slipped on the other end of the stop-screw, the division reading against a mark on the stop pillar. In this case, the end of this screw is turned like Fig. 17, and the cylinder put on, and secured by a pin.

One mode appears as good as the other, and the divided cylinder may very well form part of the head, like Fig. 18. In Fig. 19 is shown one way of fixing the main frame of the rest, in either of two positions, viz., parallel to the lathe-bed, or at right angles to it. Four longitudinal grooves are cut or milled in the tenon very truly, and into either of these the point (or end turned to fit the groove) of a small set-screw (A, Fig. 9) falls. This screw does not actually clamp the tenon, but is intended merely to secure the position of the frame, which is then secured by the stronger clamping-screw. The grooves, observe, do not hinder the vertical adjustment effected by the screw ferule. These grooves must be marked with the aid of the division-plate when the tenon is turned, and can then be drilled out with a revolving-drill fitted in the slide-rest, or with a milling-cutter so held and driven from the overhead. Another way is to have a rest socket cast, with two projections at its upper part, which is, in fact, a plate about ⅜ inch thick, and so shaped as to project in two directions round the central pillar. Pins with adjusting screws are fitted to a similar plate cast on and under the main frame, and such pins, coming in contact with the projections on the socket pillar, serve to set the frame in its correct position. As some difficulty attends the making of either of these contrivances, I have shown a very simple and sufficient substitute—a bit of bent steel spring clearing the screw ferule, and having its point close to the pillar of the rest-socket, which is to be turned and marked with four lines or dots, the position of which can readily be found by experiment. It is, of course, to be presumed that the sole (Fig. 14) stands exactly at right angles to the lathe-bed, or no such stop or adjustment will be of use. To secure this, a cradle is generally used ; but, if one side of M is planed, a set-square applied to it will enable it to be set with great accuracy, although not so quickly as can be done with the cradle.

Now let us recur to the mechanical work. It is plain that this better class rest is not one to be taken in hand "unadvisedly, wantonly," or without due consideration as to the means and capabilities of the workman. It is not an impossible job, as turning, filing, and drilling will accomplish it, if only the workman is an adept at these fitter's handicrafts. But undoubtedly the tool slide (Fig. 10) will, of itself, test a workman's skill, if it is to be done by hand. In a shaping-machine, planer, or milling machine, it would not be a task of great difficulty. In the present case, the whole piece will be cast so that its outline, including the lugs, will be sufficiently defined ; and the first work will be the

grooves—to fit the chamfered bars. The sides in which these occur must therefore be trued up with a file, and also the bottom, and then the grooves marked a little narrower than ultimately needed, by means of a scriber. Then grind up a three-square file to a suitable angle, and gently chisel out the groove, leaving it too narrow, so that it will still need file and scraper to finish it accurately to fit the bars. When it is so nearly correct that you feel you cannot carry it further, take the bar itself, and a little fine emery and oil, and work it up and down in the groove. Wipe it quite clean, and substitute rouge for emery, and work it till a good fit. Then wipe again, and finish it by a few strokes with oil alone. The best scraper to use is a three-square file ground on each side till all the teeth are gone. It will cut sharply, and get into the angle; but the edge of the guide-bar should not quite reach the angle itself, so that the bearing may rather be taken by the sides of the bar.

One reason why you should begin with the grooves is that if you unfortunately spoil them, you will get a new casting, and will not have wasted your time upon the lugs and tool-receptacle. These you are not so liable to spoil. Fig. 20 is the best form of lug with pinching-screw, but the latter is often omitted altogether. It serves, however, not merely to tighten up the nut when worn loose, but to clamp the stop-screw after it has been adjusted to the required distance from the stop-pillar. It cannot then be accidentally turned in either direction. The grooves in the tool-receptacle (the channel of which is always $\frac{9}{16}$ inch each way, to suit the shank of standard drillstocks) has to be cut out with narrow chisels and files after accurate scribing. A slight error here will not be fatal, but all care is to be taken to get out a clean, square groove.

It ought to be milled, and those who have the necessary lathe apparatus will, of course, pursue this method, and save an awkward job.

After a sufficiently deep line has been cut, I think, a thick saw is really the best tool, and, if sharp, will cut a very capital groove. It must be well strained in its frame. It is possible, also, with a fine and thin saw, like a fret-saw, to cut two parallel lines, and then to chisel out the intermediate solid strip. Either plan will do.

Other details of work will suggest themselves, and as this is already a long article, I must postpone details of cradle and other apparatus. The form of rest is modern, and, although, year by year, fresh additions are being made to render it more perfect, it will, as described and illustrated in the present paper, serve its purpose, and give satisfaction in every respect to the amateur who, on careful and patient work, succeeds in its construction.

THE SPECTROSCOPE, AND HOW TO CONSTRUCT IT.

By O. BECKERLEGGE.

II.—Tubing for Telescope—Cells—Bayonet Joint for Securing Cells—Ring—Construction of Telescope—Stand—Fixing Collimator to Stand—Collar—Index—Prism.

TO make our telescope, and complete our collimator, we shall want two pieces of tubing, $11\frac{1}{2}$ inches long by $1\frac{1}{2}$ inches diameter. At first I proceeded to make my instrument with tin-plate; but before I proceeded far, I made the discovery that brass tubing of any diameter can be easily procured, which has the advantage of being stronger, looking better, and, in the end, being just as cheap. After hunting amongst philosophical instrument makers in London in vain for what I wanted, I lighted on Staunton, 21, *Shoe Lane, Fleet Street*, and found I could get any size tubing at 10d. per lb., or drawn tubing at 2s. 6d.; but as the drawn is much thinner, and consequently not so heavy per foot, it is not much more expensive. However, for my body tube, I was content with the 10d. No doubt he would forward small quantities by parcels post. I have been several times, and have found them exceedingly obliging. Procure two lengths of tubing, $11\frac{1}{2}$ inches long by $1\frac{1}{2}$ inches diameter; file ends true. In one end of each we must fix a cell containing a plano convex lens, $1\frac{1}{4}$ inches diameter and of 12 inch focus. If you can manage to have a thread cut in tube, also on the cell, so much the better. I shall, however, suppose we are working without lathe or screw tools. Take piece of sheet brass large enough to cut two discs $1\frac{3}{4}$ inch diameter. Make central punch mark, and with a compass draw a circle $1\frac{3}{16}$ inch diameter. Measure inside diameter of the body tube, and draw a circle on the disc, just a shade larger than it. Bore out a central hole up to the smaller circle. I have found it possible to cut such a hole in brass with an ordinary centre-bit; but any smith would do such a little job for a few pence, especially in country towns—the ordinary smith has all the appliances for boring. It should be countersunk on the opposite side to that on which the circles have been marked.

I will take for granted the lenses are exactly $1\frac{1}{4}$ inch diameter. If they are not, then the difference must be calculated and allowed for in making central hole and subsequent operations. Take a short length of tubing, $1\frac{1}{4}$ inch internal diameter, and $\frac{3}{4}$ inch long; if it will not just fit the lens, cut a piece out, and make it fit—not to pinch or jamb it, but with the smallest possible shake. Lay this on disc, and solder, leaving a very narrow ledge on which the lens will rest.

Before proceeding further, we must fit this cell into

body tube. We shall find that the ring just now soldered on is smaller than the body tube. We can rectify this by *packing up*. For this purpose, cut another ring, large enough to go over the first; let it be too *small* rather than too large. Clean the outside of the first ring and the inside of the one last made, and run a coat of solder on each. Put on the outer ring, which must be slit; this will enable you to bind it on the other with wire. When quite close, take a hot soldering-iron and plenty of solder, and you will have no difficulty in soldering them together. I will suppose that now it is rather too large to go easily into the body tube. You must carefully file it until it will slip in smoothly, but tightly. In a lathe, of course, it could be made better, and also to screw in; but we have not such an appliance at hand, and so must fix it without, which we will now proceed to do. Take a thin file, such as a warder file, cut a slit of an L shape in each side of the body tube; place in the cells, and at the extreme end of slit make a centre punch in the cell. Drill a hole, and solder in a pin of brass wire; this will form a bayonet joint, and firmly hold the cell in its place, Fig. 3. To secure the cell, it is pushed into the tube, with the pin passing through the longitudinal slit, and a slight turn given, so that the pin passes through the slit, which is at right angles with the first. We will consider these two cells now finished.

Make a ring out of a piece of tubing large enough to slip tightly into the cap, carrying the jaws, cutting out a piece at one edge to make way for the nut in which the screw works. When the ends are properly filed true, solder it to a disc of brass $\frac{1}{4}$ inch larger in diameter than the ring. Exactly in the centre of this disc cut a hole the size of body tube, place in tube and solder, seeing, first of all, that everything is square and true. When this is done, place on jaw cap, and the collimator is finished, except cleaning and blacking (Fig. 4). The other tube is for our telescope, and for this we must now make an eye piece. For this you will want two lenses (eye and field lenses); we will refer to these particularly further on.

FIG. 5.—TELESCOPE IN SECTION.

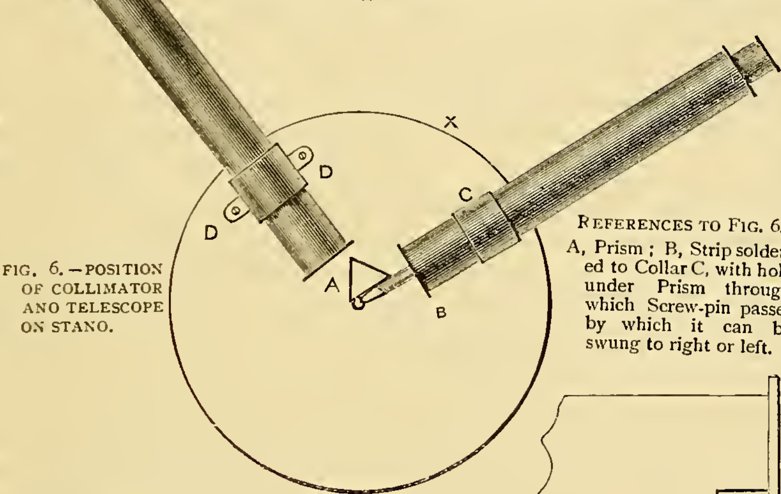


FIG. 6.—POSITION OF COLLIMATOR AND TELESCOPE ON STAND.

REFERENCES TO FIG. 6.
A, Prism; B, Strip soldered to Collar C, with hole under Prism through which Screw-pin passes by which it can be swung to right or left.

FIG. 4.—COLLIMATOR TUBE IN SECTION.

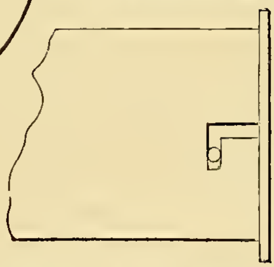


FIG. 3.—TUBE WITH BAYONET JOINT.

Get 8 inches of drawn tubing, 1 inch in diameter, cut off 3 inches; one-eighth of an inch from one end of this piece, pack up with rings of brass, as before described, till it fits tightly and smoothly into the body tube the opposite end to that in which the object cell has been fitted. Take a disc of sheet brass $\frac{1}{4}$ in. larger in diameter than the body tube, cut a central hole large enough to admit the projecting end of the tube, and solder. See that this packing is perfectly true, and that the disc stands perfectly square with the axis of tube. Make a bayonet joint, as before described; this will now form a secure collar in which the eye piece will smoothly work. I must express, even at a risk of repetition, the necessity of this collar tube being perfectly concentric to the body tube; if not, the eye piece will not look at the centre of the object lens, but at one of its margins, which would be optically fatal. Now take the remaining 5 inches of tubing which you have left, put a saw-cut the entire length; this will probably take away sufficient material to enable the tube to be bent small enough to pass tightly into the collar now made. If the saw-cut does not take away enough, a file will complete the job. When of the right size, a drop of soldering fluid and a little solder will make the joint as strong and good as need be.

Make a cell to hold the eye lens exactly like the one made for object lens, the difference being only in the dimensions. Another must be made for the field lens, only in this case there must be no projecting edge, as it must slip into the eye piece.

We now want three stops—one for each large tube and one for the eye piece. With a piece of tin plate or brass, make that which shall resemble a pill-box lid with a central hole; the stop of a size to fit tightly into the respective tubes. The hole in the large ones must be about $\frac{3}{4}$ inch, in the small one about $\frac{1}{2}$ inch. Place the large stops in the centre of tubes—that is to say, about $5\frac{1}{2}$ inches from either end.

In the eye piece it must be $1\frac{1}{2}$ inch from the eye lens, and the field lens must be pushed in to within an equal distance.

So far, the lenses are loose in their cells. A ring of stout brass wire with some spring in it, if placed in the cell, will keep lenses in place. The interior of all tubes must be made a dead black; this may be done with a paint of lampblack and turps, with a little gold size to give it body.

Before we pass on to construct the stand, etc., we must say a word in reference to the lenses required. For the object lenses you will require two plano convex lenses, $1\frac{1}{4}$ inch diameter and 12 inch focus; of course, one for each tube. For the eye piece you require a field lens, say $\frac{3}{4}$ inch diameter, and 2 inch focus; eye lens $\frac{1}{2}$ inch diameter and 1 inch focus. Birmingham is the home of lenses. I knew a person who trotted up and down London, in all the principal optician's shops, to get a set, and could not, unless they were made to order, when the price was enough to deter any amateur. I, however, found no difficulty in procuring what I wanted from Mr. Lancaster, *Colmore Row, Birmingham.* The $1\frac{1}{4}$ inch chromatic are 1s. 6d. each; common ones, 1s.; the $\frac{3}{4}$ inch and $\frac{1}{2}$ inch about the same price. Of course, achromatic object lenses are best, though not essential; I find his are only 5s. each. I have found, as an amateur of thirty years' experimenting, that often where to get what is wanted at a reasonable price is a most difficult thing to discover, and there are but few, seemingly, who care to bother with the amateur. Mr. Lancaster I have found, however, to be an exception.

Let us now proceed to mount our tubes. Get or make two discs of, say, mahogany, 12 inches in diameter, $\frac{3}{4}$ inch thick, and a pillar 8 inches or 10 inches high. Let one disc form the top of table, the other the foot. To make it steady I made three blocks to be glued and screwed to the under part of foot. Let them project, say, 3 inches beyond the foot. They will give both finish and stability to the stand.

The collimator is to be fixed to the stand, but in a collar, so that it may be pushed nearer to or further from the centre. The telescope must also be fitted in a collar like the other, but must be so fixed that it can swing to right or left. Take two rings of brass about $2\frac{1}{2}$ inches wide, and of a size to allow the tubes to slide firmly and smoothly. On one side of each solder a strip of brass $\frac{3}{4}$ inch wide, $\frac{1}{4}$ inch thick, and of the same length as tube is wide. This will lift the tube well up from the stand. To the ring for collimator, solder another strip $\frac{3}{4}$ inch wide at right angles to the first. It will thus project each side of ring as ears, as shown in Fig. 6, at D, D. Countersink hole in each end, and screw it to stand, being careful that it is placed so that the tube shall be at right angles with the diameter of stand.

To the other ring or collar solder a second piece, but not across as in the first instance, but longitudinal, as the piece already soldered on. This should project $\frac{1}{2}$ inch at one end, and, say, 3 inches at the other. Place it on stand so that the outer edge of collar comes flush with the edge of the stand. Make a mark where the other end of strip covers the centre of the stand. Bore $\frac{1}{8}$ inch hole, place a pin of wire in centre of the stand through the hole just made in the tail-piece of collar. The collar carrying the telescope will now swing, and take any angle with the fixed collimator. The reason for this will be shown further on. If everything has been made properly, if the telescope is swung around opposite to the collimator, the axis of the two tubes will be identical, or in perfect line; and on opening the jaws the thread of light will be seen in the centre of telescope. The opposite end of the strip which forms the centre, by which the collar swings, projects about $\frac{1}{2}$ an inch. Mark where it touches the diameter of the stand, drill a small hole, and solder in a pin to project $\frac{1}{2}$ inch on the under side. Around the edge marked X X, in Fig. 6, screw a strip of brass as wide as the top is thick. This must be marked off in degrees of a circle. This will form an index supposing you wish to use the instrument to measure the defracting angle of prisms of various density, also to identify positions of the different lines in spectrum. We now come to consider the prism. If you purchase one, then little need be said. One can be purchased for about 7s. Supposing you have had labour enough with your instrument and do not intend to make a prism, you will need to mount the one purchased. To do this take a piece of mahogany $\frac{1}{2}$ inch thick and 2 inches square. Cut out an angular recess in the centre, about $\frac{1}{8}$ inch deep, which shall firmly hold the prism. Drive two or three pins of stout wire in the under side of prism stand, with ends projecting $\frac{1}{2}$ inch. Carefully adjust the prism so as to get best effects, and bore holes in the table to receive the pins. Glue on three sides of the under part of stand slips of

wood $\frac{1}{8}$ inch thick. This will allow the radiating stem of the telescope to freely move without shifting the prism.

Our spectroscope is now finished, and if the details have been attended to, I know the results will be satisfactory. I may say in constructing my own I have availed myself of a latbe, and my cells are screwed; but I have been writing for those who cannot command tbose things; but for practical purposes the plan indicated is all that need be. In practice I have found it advisable to cut a circular slit in tbe table about $1\frac{1}{2}$ inch from diameter, and about 3 inches long. I then screw and solder a threaded pin in the under side of tbe radial bar, carrying telescope collar. This passes through tbe slot in table; a winged nut on tbe under side will fasten telescope to table. I have also found two ears or wings, projecting at right angles from radial bar, make it more steady and firm. Of course, there must be a hole in tbe end of bar, and screw, passing through it into the centre of stand.

I have been making a bisulphide of carbon prism to use with my instrument; apart from the time occupied in making, it is much cheaper tban an ordinary one of glass; but this I must leave for a future paper.

If a joint is made in the pillar perpendicular with tbe collimator, tbe instrument will be more efficient for astronomical purposes. The position of prism will be best found by trial.

HOW TO MAKE A BERCEAUNETTE PERAMBULATOR.

By A PRACTICAL CARRIAGE BUILDER.

III.—Sizes and Prices of Wheels with Rubber Tyres—Wood Wheel Making—The Wheel Pit—Naves—Spokes, Rims, or Felloes—Making Mould.

BEFORE proceeding with the process of making wood wheels, I think it advisable to give a quotation of sizes and prices of the rubber tyre wheels I recommended, stating also where I bought my own wben required; but in speaking of this firm, I wish it to be particularly understood that I have no personal interest wbatever in the recommendation, beyond the fact that I know these wheels and axles to be well and strongly made, and have good rubber tyres, are neatly finished, and always likely to ensure satisfaction to the buyer. I have no doubt there are other makers as good, but as I have been always perfectly satisfied witb the general behaviour of these wbeels, have never bought elsewhere, and having used similar, but larger wheels for bath and other invalid chairs and carriages, am glad to say I have found them all equally satisfactory. The firm I allude to is that of Messrs. Warman, Laxon, Youett and Co., *Victoria Works and Albion Mills, West Orchard, Coventry.*

Prices of wheels and axles as follows:—

		s.	*d.*
Three Wheels to the Set.			
Hind Wheels,	20 in. high, front, 14 in.	13	0
ditto	22 in. high, front, 15 in.	14	0
ditto	24 in. high, front, 16 in.	15	0
Four Wheels to the Set.			
Hind Wheels,	20 in. high, front, 14 in.	15	0
ditto	22 in. high, front, 15 in.	16	0
ditto	24 in. high, front, 16 in.	17	0

All fitted with split pin to axle and a neat brass cap nut, to screw on outside of stock of wheel, covering the ends of axles and keeping out dust, etc. They will be forwarded to order on receipt of a remittance, including one shilling for packing in crate; the purchaser paying carriage on receipt of wheels.

I will now endeavour, as clearly as possible, to give the process of wood wheel-making, after which, I will conclude this subject with mode of making and fitting up the hood, and also the painting and trimming; thus completing the whole of the several branches, as nearly as actual practice has acquainted me with what is required to turn out a strong, serviceable, and, what is of considerable import, a very cheap child's carriage.

Now as to making the wheels. I take it for granted that any amateur about to build a perambulator, or, indeed, anything else, that requires any sawing or planing, already possesses a small workshop with a bench firmly fixed to the floor or side wall, or perhaps a very good makeshift in form of a dresser in a kitchen. Lacking either of these, take my humble advice and procure as soon as possible, one of Mr. Thomas Syer's very excellent portable benches, as advertised in the pages of Amateur Work.

I make special mention of this bench in question, because a wheeler requires what is known in our trade as a wheel pit, which is a very stout wood frame, strongly fixed together, with a slit or opening between the ends and sides, long enough to admit a wheel six feet high to be dropped down into it, but only just wide enough to catch about $1\frac{1}{2}$ inches of back and front of the stock or nave of the wheel, which is so fixed that the nave can be turned round freely while the spokes are being driven or the mortises cut to receive them; well, for small wheels such as we are discussing, such a pit is quite unnecessary, but an expedient is, and must be had, or no wheels can be made, therefore, I will suppose a bench is at hand.

Get two pieces of oak or ash, 3 feet long, 8 inches

wide, and 2 inches thick, plane them up tolerably true, and square their edges, but need not be too particular; now get a block, say 10 inches long, 8 inches wide and $2\frac{1}{2}$ inches thick, plane the same as other pieces, keeping the two widest surfaces parallel; bore three $\frac{3}{8}$ inch bolt holes in the bottom of the two longest pieces, as marked in Fig. 13. Now place the block before mentioned between these two pieces, keeping bottom ends and both sides level with each other. Fix them thus with a cramp (*i.e.*, sometimes called a clamp); now bore one hole quite through the block, etc., put in a bolt; put an iron washer on outside under the nut, and screw up tightly, but do not forget to put some grease on the bolt; also, before putting in, fix bolt in vice, and screw the nut down as far as the screw is cut, if not done the force required to screw up the nut afterwards may turn the bolt in its hole, a very annoying result, and must of necessity be avoided, or it cannot be screwed up tight. When tightly fixed, see that the edges of the two long pieces are true with each other, if not, make them so; then bore the other two holes, but do not put in the bolts. Now with a carpenter's square and pencil mark a line all round the top of both long pieces at A, Fig. 13. Saw off all these lines so that both pieces are quite square and level. Again mark lines on both sides and top, exactly as at B, B, and again $2\frac{1}{2}$ inches from tops, as at C, C. Now loosen the bolt at bottom and move the uprights away from each other, as at Fig. 15, and with compass draw a circle 2 inches in diameter at D; again set the compass so as to draw a circle $1\frac{1}{2}$ inch diameter, at E; this upright is the back piece. Now turn the work over, and draw two circles at F and G, each $1\frac{1}{2}$ inch diameter; now with gouge and chisel, sink all these circles just a quarter of an inch below the surface of each piece. Be careful to get them same depth all over and quite level, as it is into these places that the backs and fronts of the naves of wheels are to be held, while mortising for and putting in the spokes, and fitting and fixing the felloes. Having properly sunk all the holes, replace the uprights in proper position; place the back side of the back piece against the foremost leg of bench, of course, removing the screw, if there is one. Cramp in this position and secure it temporarily, take it down, put in the two other bolts at bottom of uprights, screw up firmly and refix the whole to the bench. Fig. 14 shows end view of frame when the parts have been screwed together, and Figs. 16 and 17 front views, when fixed to bench. H is a crossbar screwed on to outside of front piece, extending beyond greatest diameter of wheel, 2 inches wide, $1\frac{1}{2}$ inch thick. A long nut-headed screw in each end of this, working freely, enters two corresponding holes in bench and draws the two uprights together, thus holding the nave firmly when placed in the sunk holes before mentioned, this, then, is a good serviceable substitute for a wheel pit. Now for the wheels themselves.

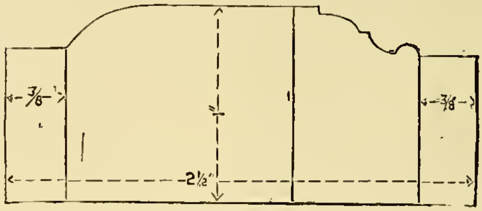
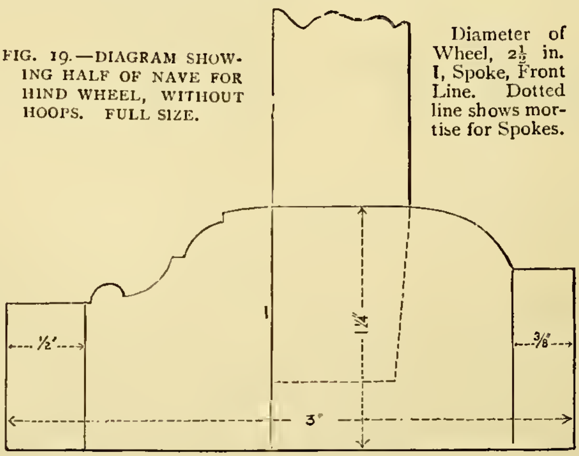


FIG. 18.—DIAGRAM SHOWING HALF OF NAVE FOR FRONT WHEEL WITHOUT HOOPS. FULL SIZE.
Diameter of Wheel, 2 inches. I, Spoke, Front Line.

Procure a piece of sound, hard and well-seasoned ash or elm, about 16 inches long and $3\frac{1}{2}$ inches square. This is for the naves, which the amateur, if he has a lathe, can easily turn up for himself, failing which any wood-turner will do it very cheaply. But supposing he does it himself, proceed thus:—find the centre of both ends by marking cross lines from four corners, chop off all four corners and mount in the lathe as usual, mark off two lengths of 3 inches each and two of $2\frac{1}{2}$ inches, leaving sufficient wood between each to allow for parting, when turned up. The two longest are for naves of hind wheel, and shortest for front ones. Turn all down to sizes of Figs. 18 and 19, and make a mark (I) on each before taking out of lathe; this is to guide in mortising spokes in regular. In nearly all carriage wheels, two marks are made, one $\frac{1}{2}$ an inch inside the other, so that the spokes can be mortised in, off and on; that is, half the spokes level with front line and other half with the inner line, but this is quite unnecessary in

FIG. 19.—DIAGRAM SHOWING HALF OF NAVE FOR HIND WHEEL, WITHOUT HOOPS. FULL SIZE.



Diameter of Wheel, $2\frac{1}{2}$ in. I, Spoke, Front Line. Dotted line shows mortise for Spokes.

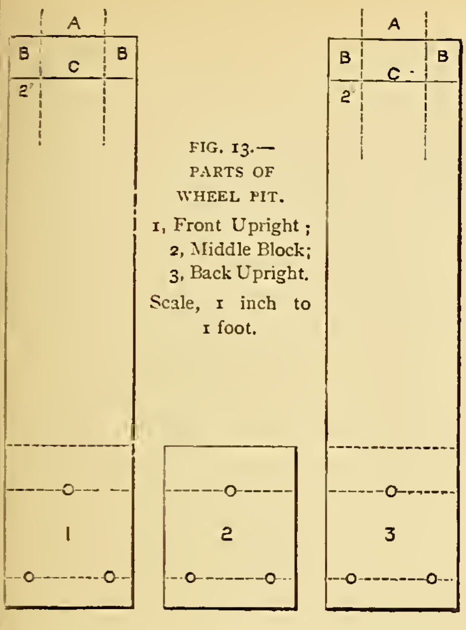


FIG. 13.—PARTS OF WHEEL PIT.
1, Front Upright; 2, Middle Block; 3, Back Upright.
Scale, 1 inch to 1 foot.

BACK PIECE Scale, 1 inch to 1 foot.

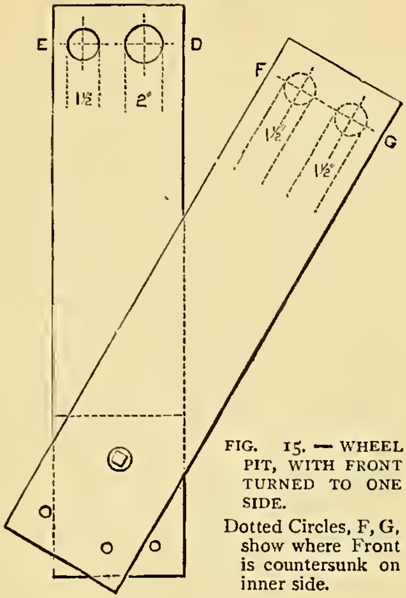


FIG. 15.—WHEEL PIT, WITH FRONT TURNED TO ONE SIDE.
Dotted Circles, F, G, show where Front is countersunk on inner side.

FIG. 14.—END VIEW OF WHEEL PIT SCREWED TOGETHER.

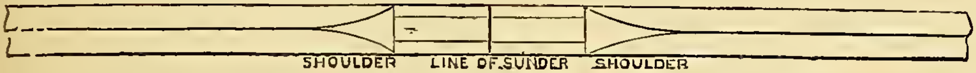


FIG. 20.—DIAGRAM SHOWING HOW TO DRESS UP AND MARK OFF SPOKES IN PAIRS. Scale, half size.

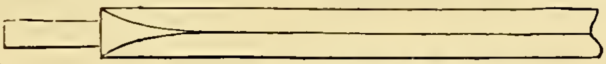


FIG. 21.—INNER END OF SPOKE, SHOWING TENON READY FOR DRIVING INTO NAVE.
Scale, half full size.

FIG. 22.—DIAGRAM SHOWING POSITION OF WEDGE IN OUTER TENON OF SPOKE.
Scale, half full size.

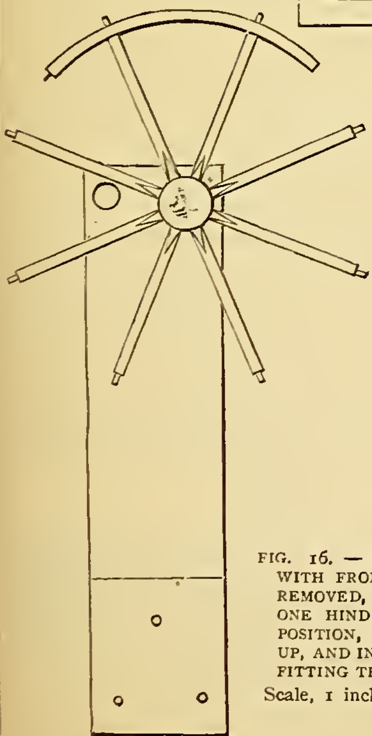


FIG. 16.—WHEEL PIT WITH FRONT UPRIGHT REMOVED, SHOWING ONE HIND WHEEL IN POSITION, SPEECHED UP, AND IN PROCESS OF FITTING THE FELLOES.
Scale, 1 inch to 1 foot.

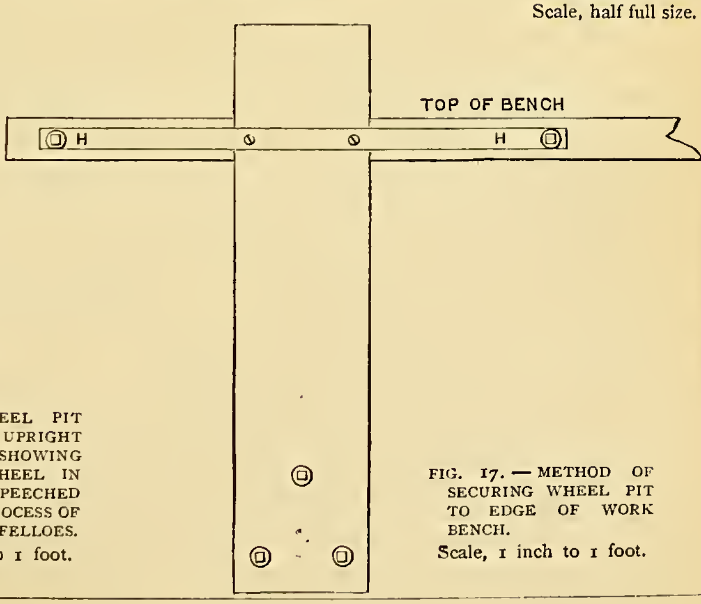


FIG. 17.—METHOD OF SECURING WHEEL PIT TO EDGE OF WORK BENCH.
Scale, 1 inch to 1 foot.

perambulator wheels. Having turned up the naves, part them, and place on one side. Now for the spokes. Obtain some nice clean and straight-grained birch, and saw out eight lengths 22 inches long, plane these up $\frac{7}{8}$ inch wide and full $\frac{1}{2}$ inch thick, each of these when shaped out and cleaned up, and cut in the middle, will give two spokes—sixteen in all, eight to each wheel. Now cut eight other lengths, 15 inches long, plane same as others, but a little smaller each way; these cut as before make sixteen for front wheels. They could be cut the proper lengths at once, but being so small, it will easily be seen how much better two can be made together, than each one separately. To shape these spokes, find the centre of each length and square a line all round; this is where each pair of spokes must be cut asunder when nearly finished. Now mark two other lines all round, each $1\frac{5}{8}$ inch away from the centre line; this is for the shoulders. Now chamfer away from these second lines and gradually work up the spokes to a nice oval at their outer, or tang ends, leaving a nice triangular face on both front and back of each spoke, as in Figs. 20, 21 and 22. Fig. 20 showing how to mark off, and Figs. 21 and 22 how the spoke should be finished. Before cutting asunder, mark two parallel lines on each front and back with a carpenter's mortise gauge; these lines to be $\frac{5}{16}$ inch apart, and equidistant from sides of spokes; now cut spokes asunder, and cutting down each side of these last lines as far as the shoulder, then cut shoulder lines to meet, but be careful to cut only just down to parallel lines, leaving the middle piece in solid; this middle piece being the tenon by which the spoke is held in the nave, and if this tenon is carelessly sawn into, the spoke is almost certain to break short off, either when being driven or when the tyre is being fixed; this would cause great annoyance and trouble, as the mortise must be recut and a new spoke made and fixed.

Now as to rims or felloes. The amateur will require a mould or felloe pattern, and as this mould will not be exactly the shape of the felloes when the tyre is on the wheel, and the felloes cleaned up and finished, it will require some very necessary details to be explained here to prevent disappointment, for were this pattern to correspond exactly with the circumference of a finished wheel, another wheel, whose felloes were worked up to it would be of an entirely different shape, and, instead of being a circle, would be a series of irregular sweeps all round the rim. This little, but most useful wrinkle most wheelers try to keep a trade secret—albeit, it can be hidden in the proverbial nutshell, and simply rests in making the mould up larger in its outer circumference than the wheel is actually intended to be; experience alone will tell a mechanic how much this excess should be.

Now I am not a wheeler myself, but for many years past have given close attention in particular, to all matters concerning wheels and axles, and my observations have proved to me that all wheels made with felloes from 1 foot to 3 feet high, should have the mould $\frac{1}{4}$ inch allowed to each 1 foot higher, the wheel may be. Thus, if the wheel is 1 foot high strike out the felloe pattern to a circle of $12\frac{1}{4}$ inches; if wheel is 2 feet high, then the circle should be $24\frac{1}{2}$ inches; if a 3 feet wheel, the circle should be $36\frac{3}{4}$ inches, from that height an allowance of $\frac{3}{8}$ inch up to 5 feet 6 inches high. The amateur may think it needless to mention this, but I assure him this is a mechanical principle in wheel making, which must on no account be overlooked or omitted, and it applies exactly the same to a wheel of 6 inches diameter, as to one of 6 feet; and I will now endeavour to explain why in making up a wheel whose rim is composed of two, four, or, in fact, any number of parts called felloes. Each end of each felloe has to abut or fit dead on to one end of its immediate neighbour; this is firmly effected by the tyre being made smaller than the outside of the rim. The tyre being hot, expands, when it is quickly knocked on the wheel and suddenly cooled in water. This cooling so contracts the tyre as to draw the felloe joints together with great force, and as each joint comes in between two spokes, there is nothing to support it; consequently, the force of the tyre would drive each of these joints in beyond the inner circle, and the spokes keeping it out just over their tops, the figure would be, as I said before, irregular all round the wheel, showing at once the want of knowledge to counteract this result. Now by making the circle of each felloe larger, when they are all fitted in their places and down on the shoulder of spokes, where every joint comes and the juncture of the two corresponding felloes, there will be a very visible hump; the amateur says at once, "This won't do, the wheel will never be round," but I assure him it will; it is just this hump which supports the rim at its weakest points by offering a greater resistance to the inward force of the tyre. And if your wheel is not accurately round at first, it will speedily settle into the proper shape by use, and will wear three times as long as it would, if this precaution had not been taken.

I have by me now in good condition a set of perambulator wheels made by myself thirteen years ago, and I made them under the supervision of a thorough good wheeler of the old coaching days, and his anxiety on this point struck me as rather extreme at that time, but I quite agree with him now, for I frequently see really beautiful carriages spoiled in appearance and utility by neglect of this all-important detail. Sincerely trusting I have made

this quite clear to all readers, I will now return to making up the mould and preparing the felloes.

Our hind wheels being 24 inches high, strike out on a board a circle $24\frac{1}{2}$ inches diameter; now divide equally into four, by two lines crossing each other in centre; now get a piece of pine, or other wood, $\frac{1}{4}$ inch thick, and with compasses set to the same diameter, strike a line and cut out to fit exactly one of these divisions, then set a gauge to $\frac{3}{4}$ inch. Gauge an inner line and cut out to shape; this is your mould for hind wheels. Proceed precisely the same for the front felloe mould, but as front wheels are only 14 in. high allow $\frac{3}{8}$ inch higher, making diameter $14\frac{3}{8}$ inches.

As there will be eight spokes to each wheel, there must be four felloes also, as two spokes must be fitted into each felloe. So now procure a piece of strong tough ash plank, $1\frac{1}{2}$ inch thick, with straight even grain, no knots or splits of the smaller; lay your mould on one side of the plank and mark out both edges of your mould, but leave both ends $\frac{1}{4}$ inch longer for fitting; now shift pattern to allow for saw kerf, and mark again same as before, until having marked four, cut them out and place on one side in some dry position; each of these split down in centre with a saw, will make two good felloes. Now mark and cut out the front ones in the same way. Now face or plane up each side of each piece, taking as little off as possible; now set a gauge to full $\frac{5}{8}$ of an inch, and mark a line all round middle of thickness of each piece; from each planed up side and with a sharp saw, cut nicely between the lines. When all are cut thus, plane down to gauge lines, dress up outsides and insides to shape of moulds, and they are ready for fitting and boring on to ends of spokes. The naves being turned up and separated, divide with compass eight equal divisions on the line marked on or near the middle of the largest diameter; begin with the hind ones, and when both are marked thus, proceed with front ones exactly the same, with the exception of altering compass to suit divisions, the fronts being smaller diameters.

(*To be continued.*)

SIMPLE FRETSAW ATTACHMENT FOR ANY LATHE.

By J. S.

SOME time ago, I wanted to do some fret-work, but having only got a hand fret-saw, it seemed to me that it would be but slow and tedious work to cut out the pattern with such a tool as this. I could not afford to buy a machine, so I thought I would try to make one, and having a very serviceable lathe I determined to utilise it for the fret-saw.

Having made many plans and altered them again, at last I set to work, and, with but little trouble, and even less expense, made a very useful machine, with which I have already done a great deal of good work, including cutting veneer.

I will suppose some amateur to be in the same position as I was; let him set to work as follows. I ought, however, to say that my lathe is one of $4\frac{1}{2}$ inch centre, with a bed 6 inches wide over all, and about 4 inches deep. Of course, the details of the fret-sawing machine would vary slightly with the size of the lathe, but it will be easy to determine what the difference ought to be.

First, let the amateur procure the following pieces of wood, which I will number for convenience in reference: No. 1, two pieces white pine, 2 inches by 6 inches by 10 inches; No. 2, one piece white pine, 1 inch by 11 inches by 6 inches; No. 3, one piece white pine, $\frac{1}{2}$ inch by 30 inches by 11 inches; No. 4, two pieces white pine, 1 inch by 24 inches by 1 inch; No. 5, two pieces oak, $\frac{3}{4}$ inch by 33 inches by $1\frac{1}{4}$ inches; No. 6, one piece oak, $\frac{7}{8}$ inch by 11 inches by $1\frac{3}{4}$ inches; also two ordinary jointed iron fret-saw clamps, which may be procured from almost any dealer in tools.

Now take the piece of oak No. 6, and, laying it flat on the bench, mark it as shown in Fig. 3, which is on quarter scale. Now cut out the pieces marked A, B, leaving a slot at each end, 2 inches long by $\frac{3}{4}$ inch broad, and $\frac{7}{8}$ inch deep; then take the two pieces No. 5, and at 21 inches from one end of each lay them in the slots above mentioned, not quite touching the bottom of either slot. With a $\frac{3}{16}$ inch gimlet bore a hole through the cross-piece, and each of the other pieces at 9 inches apart, and put a pin through each of these holes to keep the three pieces together. Now, at 1 inch from the end of each of the long pieces, make a square hole sufficiently large for the ends of the saw clamps to work easily up and down; these may now be put in position. Now get a piece of round iron, $\frac{3}{16}$ inch diameter, with a thread cut for 3 inches, at one end, with a washer and nut on it; flatten out the other end, and bore a small hole in it. This piece of iron should be 13 inches from end to end. At 9 inches from the cross-piece, at the short end of the top piece of oak, bore a hole down through $\frac{3}{16}$ inch diameter. Exactly under and opposite this hole, in the other piece of wood, cut a short slot; put the flat end of the iron in this, and put a pin through the wood and the hole in the rod; put the other end of the rod through the hole in the top piece, put on the nut and washer, and screw up to the necessary tightness for the saw. The bow is now complete; its appearance may be noticed by a glance at the two figures of the saw when complete.

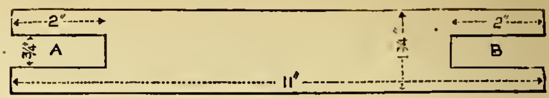
Now take piece of pine No. 2, and at each end

screw on one of the pieces (No. 1). On the top of these two screw on No. 3, allowing it to project 3 inches in front and 21 inches behind. Support No. 3 (which will be the table of the machine when completed) by the two pieces No. 4 screwed into the under angles, and holding up the back part of the table. Round off the front corners of the table, and cut a slot $1\frac{3}{4}$ inches broad and 9 inches long from the back of the table in the middle.

Before finally fixing the table and stand together, a round hole must be cut in the left-hand piece, No. 1, 4 inches in diameter, and with its centre $4\frac{1}{4}$ inches from the bottom.

A chuck of ash, $4\frac{1}{2}$ inches long and 3 inches diameter, must now be fitted tightly

FIG. 3.—PLAN OF PIECE, NO. 6.



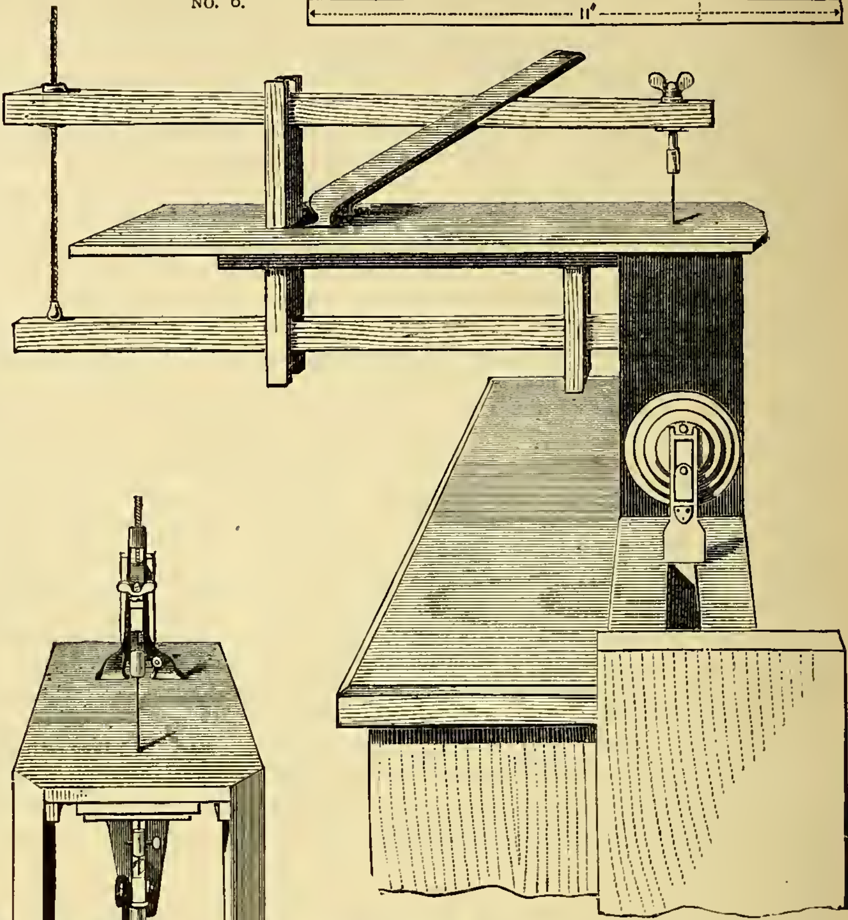


FIG. 2.—SIDE VIEW OF FRETSAW ATTACHMENT, READY FOR WORK.

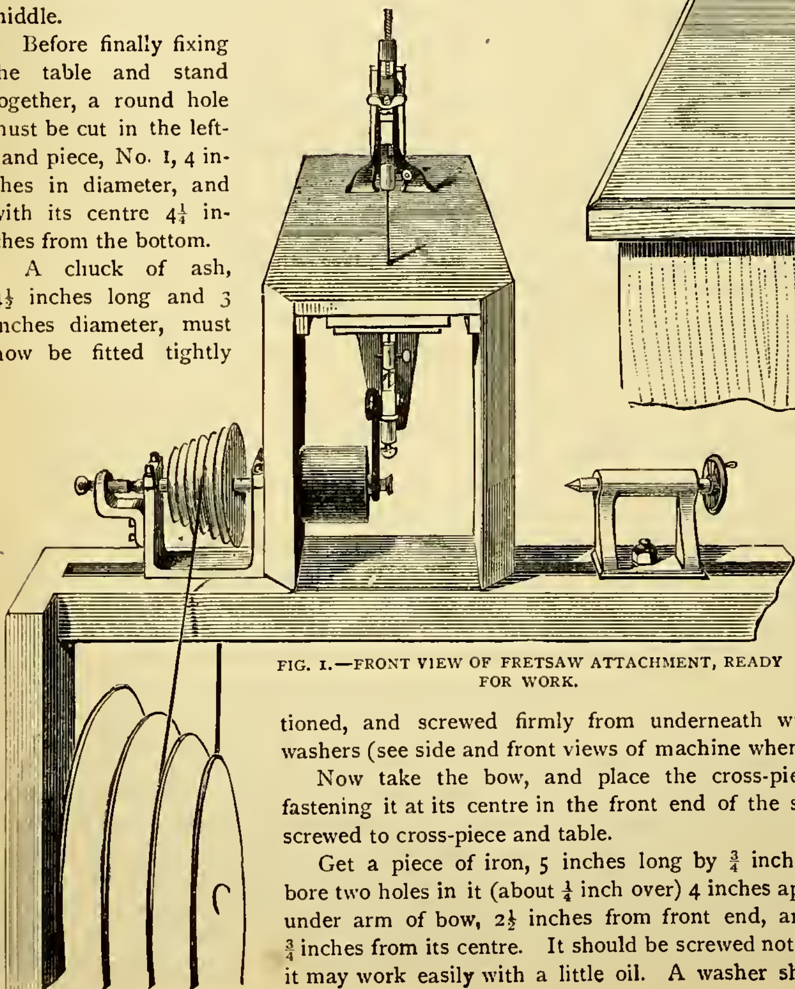


FIG. 1.—FRONT VIEW OF FRETSAW ATTACHMENT, READY FOR WORK.

on the mandrel of the lathe. The whole of the stand and table may now be placed on the bed of the lathe, close up to the headstock, allowing the chuck to protrude through the hole above mentioned, and screwed firmly from underneath with two long bed-screws with washers (see side and front views of machine when complete).

Now take the bow, and place the cross-piece in the slot of the table, fastening it at its centre in the front end of the slot, with two light iron angles screwed to cross-piece and table.

Get a piece of iron, 5 inches long by $\frac{3}{4}$ inch broad by $\frac{1}{8}$ inch in thickness, bore two holes in it (about $\frac{1}{4}$ inch over) 4 inches apart, screw it by one hole to the under arm of bow, $2\frac{1}{2}$ inches from front end, and by the other to the chuck, $\frac{3}{4}$ inches from its centre. It should be screwed not too tightly at either end, so that it may work easily with a little oil. A washer should be put on each side of the

connector, at both top and bottom; oak washers will be found the best, they are easily made, and cause less noise than iron ones.

Now bore a hole in the table for the saw to go through, and try the machine. If it should not work very steadily, put a guide of hoop-iron, about $\frac{1}{8}$ inch thick and $\frac{3}{4}$ inch broad, round the top arm, screwing it to the back of the table; the shape of this guide may be seen by a reference to the side sketch of the machine. A similar guide may be put to the lower arm, but it need not project from the back, but may come straight down, as per figure.

If my remarks have been understood, and are properly carried out, I think the amateur will have a machine which, though it may not be very elegant, will be eminently serviceable. Anything that is not intelligible I will explain in "Amateurs in Council."

HINTS ON THE UTILISATION OF WASTE MATERIALS.

By R. LEWIS.

I.—Preparation of Old Tins—Scribing Block—Handle for Cup—Pin Tray—Bending Tool—Paper Binders—Blotting Pad—Bird Scarers—Pipe Rack—Erasers—Hones—Vases—Bracket.

TO any thoughtful man waste is objectionable from every point of view, but chiefly because it is at utter variance with the teachings of nature, and, next, because it occasions an actual loss of property, both in kind and in cash—inasmuch as everything consigned to the ash-pit or the waste heap has its monetary value, infinitesimal though it be. My intention, however, is not to deliver a lecture on thrift and economy, but to touch practically on one of the points in which waste that may be avoided takes place every day, by throwing away waste materials of various kinds, and especially tin cans which have served as the receptacles of meat, butter, fish, vegetables, milk, etc., and which may be readily adapted with a little contrivance, to serve other purposes, which, perhaps, are equally important and useful.

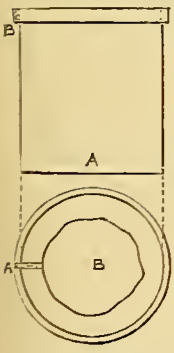


FIG. 1.—REMOVAL OF REMAINS OF LID. A, Elevation. B, Plan.

And, first, a few words will be useful regarding the preliminary manipulation or making ready of the tins themselves. As the tins are opened either at the top or side with a knife or similar instrument, the edges are not left sufficiently smooth to enable the vessel to be used for drinking, or like purposes. In the former case it may be sufficient to remove the remains of the lid by unsoldering it, which may be thus effected. With a file or other instrument make cuts at A, Fig. 1, so as to leave a band (not a ring of metal) attached to the body of the canister, then hold the part where the solder is, over the flame of a spirit lamp (spirit is the best on account of its giving the strongest heat, and without smoke); this will melt the solder, and the band may be pulled away with a pair of pliers.

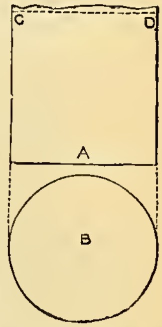


FIG. 2. — MAKING EVEN EDGE OF TIN OPENED AT SIDE. A, Elevation. B, Plan.

In Fig. 2, which has been opened at the side, a line, C D, should be drawn round the tin, and the superfluous metal cut away with a pair of strong scissors; the part where the joint occurs must be operated upon with a file or saw used for cutting metal. Having described with the scribing block a line near the top of the can (Fig. 3) and round it to the depth you wish it to overlap, and equidistant from the edge—take a pair of pliers, or the tool shown in Fig. 5 (or even a key), and with the edges touching the line marked, firmly close them, and gently incline outwards all round as at E, continue this till the metal is bent over at a right angle as at F, it can then with a hammer be gently rapped till it is brought in contact with the body of the tin. Any irregularities that may exist may be corrected by striking them with the hammer upon a round surface held inside the vessel. The pointed end of an ordinary flat iron makes a capital anvil for this purpose, as will be shown hereafter. The tins, if cut off near the bottom, will serve for saucers, or the top covers of other vessels. The wider parts should be kept for other purposes. If the tins have been painted, placing them over a clear ordinary fire will burn off the paint, and unsolder them at the same time.

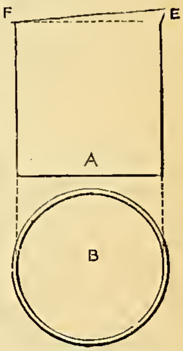


FIG. 3. — BENDING EDGE OF TIN OUTWARDS. A, Elevation. B, Plan.

Scribing Block (Fig. 4).—A is a rectangular block of wood (having all its sides flat), to which is attached a flat piece of steel, B, pointed at one end and perforated at the other, to take the screw, C, upon which it moves. To use it, place either of its sides upon the same plane as the object to be marked, then adjust the point, D, to the required height, then work this point around or along the desired direction, and a line equidistant from the base will be described.

Bending Tool (Fig. 5).—This is a piece of flat

iron or steel with a small notch cut in it. This can easily be made by any jobbing smith or person having a warding file, or saw for cutting metal. The depth and width of the notch will correspond with the depth required to be turned over, and the thickness of the metal operated on.

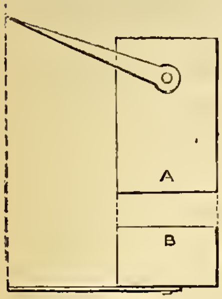


FIG. 4.—SCRIBING BLOCK. A, Elevation. B, Plan.

Handle for Cup, etc. (Fig. 6).—To form a handle for a cup, etc., take a piece of tin the required length, and bend it to the required form, and if the edges are required to be turned over, proceed as in the case of the top of the body. To fix it to the body: having rendered all the surfaces of contact clean, adjust it to the required position, and having applied a little resin, or soldering fluid, to the parts to be united, place a small piece of solder thereon, and apply the flame of a blowpipe, or if you are not the possessor of such a tool, a temporary one may be made out of the stem of a tobacco pipe with a small bore.

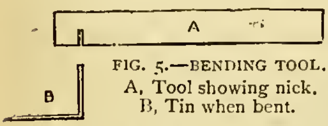


FIG. 5.—BENDING TOOL. A, Tool showing nick. B, Tin when bent.

Trays for Pins, etc. (Fig. 7).—Take a piece of tin the width required, and of sufficient length to form the curve, A B C, minding that it is square at all the angles—this is to be bent on a cylindrical mould, such as a ruler, rolling pin, or anything of a suitable size. Then cut two rectangular pieces, D E F G, for the ends. To solder them together, hold the piece, D E F G, horizontally with a pair of pliers over the lamp flame, then place the piece, A B C, in its position, and put a small piece of solder at each corner; the heat will melt this, and the pieces will be secured whilst you put a rather larger piece at C. Having applied the soldering fluid tolerably freely to the parts unjoined, apply the blowpipe flame to the solder at C; this will run down the sides towards A and B according as the flame is applied. Mind not to heat too great a surface at once, or your work will be continually coming undone.

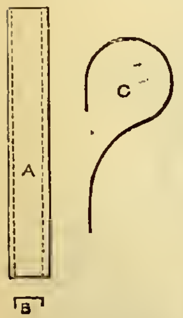


FIG. 6.—HANDLE OF CUP. A, Strip of Metal. B, Edges turned up. C, Shape when bent.

Paper Binders (Fig. 8).—These are pieces of sheet tin, brass, zinc, or other metal cut to the required length and width, and bent round a small cylinder such as a pencil. Previous to bending, bore or punch three holes on *one* side. When the paper is inserted, and the metal hammered down to keep it tight, a bradawl or similar instrument is used to make holes through the paper and the unperforated side of the metal, and the whole fixed together with thin string.

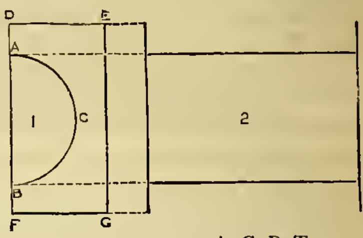


FIG. 7.—PIN TRAY. A, C, B, Tray. D, E, G, F, End Piece. (1) End Elevation. (2) Ground Plan.

Blotting Pads (Fig. 9).—Procure a rectangular piece of wood, A, about half an inch thick, of the required size, then bend a piece of tin, B C D, of the same width round a cylindrical mould; then take two pieces of tin of the same dimensions as the ends of the wood, place them at either extremities of the curved piece, and with a drill or bradawl bore three holes, E, F, G, in each, through which to pass the screws or nails, according as you wish the blotter to be removable or not. Then cut or fold pieces of blotting paper to the required size, take a sufficient number of these to form the thickness of pad you wish—fix these in their places at one end, press them round the tin, and when sufficiently strained pierce holes corresponding to those in the binding piece, put in the screws and tighten, and the pad is finished. The paper can be torn off a sheet at a time as it becomes unfit for use.

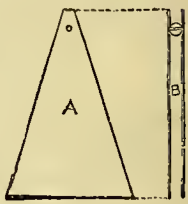


FIG. 10.—BIRD SCARER. A, Front Elevation. B, End Elevation.


FIG. 8.—PAPER BINDER.

Bird Scarers (Fig. 10).—These are merely two triangular pieces of tin with a hole at the upper end, through which to pass a string. It is as well to keep them a short distance apart by means of a bead or piece of tobacco pipe so that the wind may cause them to make a tinkling noise, while the reflection of the sun on a bright day will add to its scaring effect.

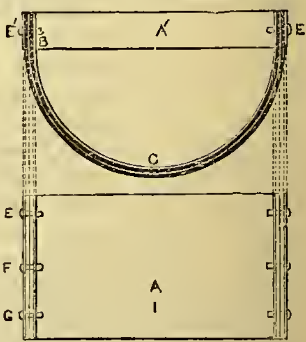


FIG. 9.—BLOTTING PAD. (1) Ground Plan. (2) End Elevation. E, F, G, Screws for fastening. Shaded lines represent blotting paper.

Pipe Racks (Fig. 11).—The difference between these and the pen-racks (that will be described in

another paper) is that only one of each pair of holes is slotted, and that the slotted sides are placed alternately right and left. The slots are cut at right angles with the front edge, instead of the back one, and the lower edge does not go down so far as the edge of the holes, so that a recess, or notch, is left, in which the pipe may rest with less danger of being accidentally displaced.

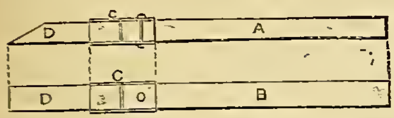


FIG. 12.—ERASERS. A, Elevation. B, Ground Plan. C, Tin Ferule. D, Pumice Stone.

Erasers (Fig. 12).—Make a handle out of a piece of firewood, or old penholder, and round one end wrap a piece of thin tin plate or other metal, which is to be retained in its position by a pin passed through it and the wood. Into the ferule thus formed cement a piece of pumice-stone, which may easily be brought roughly to the required shape by an old saw or piece of hoop-iron with a serrated edge, and finished by grinding it on another piece of pumice or other rough stone. The erasing points may be of various forms. The one represented offers a flat surface, as in A, and a sharp edge, as in B, for finer lines.

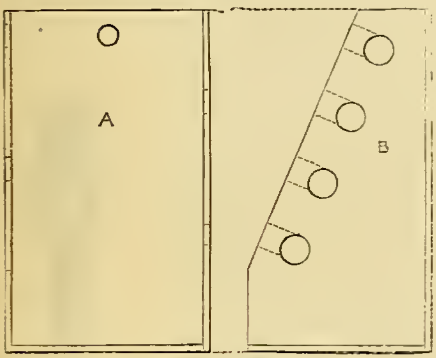


FIG. 11.—PIPE RACK. A, Front Elevation. B, Side do.

Hones (Fig. 13) can be made out of pieces of waste slate. First mark off the size, and cut them to the required form, either with an old saw, the tang of a file, or other suitable instrument sharpened. The edges of the slate can be ground true on a piece of stone, or rubbed with an old file. The slate is then cemented on a piece of wood to form a handle.

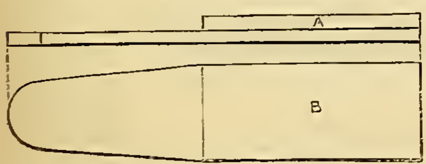


FIG. 13.—HONE. A, Elevation. B, Ground Plan.

Vases (Fig. 14).—Having made a drawing of one of the sides of the vase, A B C D, continue the two side lines until they cross each other; the point of intersection, E, will be the centre of the circles which are to be struck from the top and bottom corners, C and D, of the drawing of the one side. Then, on either of these circles, mark off distances equal to the length of the top and bottom, and from these draw lines to the centre, which will give pieces of the same size. To fix them together, lay them edge to edge correctly, and over the joint glue or paste a slip of paper or linen; when these are dry they can be folded, and the two end-pieces joined in a similar manner. The bottom is now to be formed and fixed in. To do this, measure across one of the sides where you wish the bottom to rest, and with this distance in the compasses describe a circle. Then, with the same distance in the compasses, from any part of the diameter, mark off this distance, and, with the point of intersection as a centre, make other intersections, and proceed in this manner round the circle. From these points draw lines uniting each other, and a hexagon will be formed, which will fit the interior of the vase at the part where the measurement was taken, and may be retained there by a little glue round the edges.

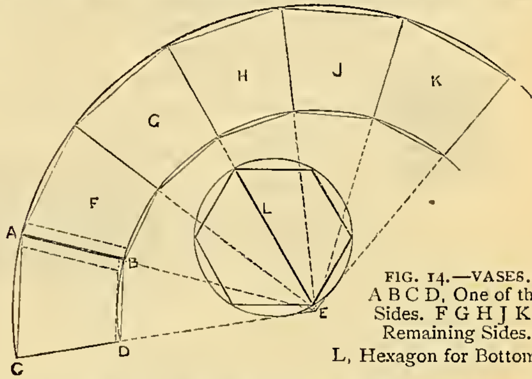


FIG. 14.—VASES. A B C D, One of the Sides. F G H J K, Remaining Sides. L, Hexagon for Bottom.

Brackets (Fig. 15).—Cut out a back-piece, A, and a semicircular piece, B, and the angular piece, C, which serves for strengthening the whole, minding that it is square at one angle; glue these in position. Afterwards bind a thinner piece for the ledge, which can then be bound with string into position while the cement is drying.

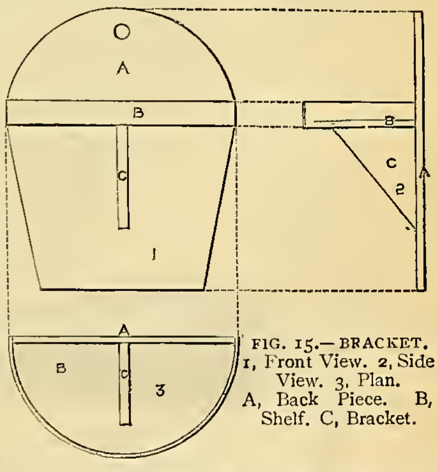


FIG. 15.—BRACKET. 1, Front View. 2, Side View. 3, Plan. A, Back Piece. B, Shelf. C, Bracket.

(*To be continued.*)

NOTES ON NOVELTIES.

By THE EDITOR.

31. NEW PATENT CHAMPION FRET SAWS (ZILLES'S). 32. BOOTH BROTHERS' CRISPIN'S AWL. 33. BOOTH BROTHERS' COMBINED SCREW-HOLDER AND SCREW-DRIVER. 34. MELHUISH'S NEW PATENT SPOKESHAVE. 35. WAUDE'S PATENT KNOCKER-BELL.

31. NEW PATENT CHAMPION FRET SAWS (ZILLES'S).—I have received from Mr. Hy. Zilles, Importer of Artistic Designs for Fretwork, etc., 14, *South Street, Finsbury, London, E.C.*, some samples of different sizes of the "New Patent Champion Fret Saw," a new candidate from the Continent for the favour and patronage of fret sawyers, for which Mr. Zilles has been appointed sole agent for Great Britain and Ireland. In my judgment, the saws are well made, and of good quality, and, basing my opinion on the sample saws sent for trial, I can recommend them. With regard to their make, these saws have a broad edge and a thin, rounded back, and the width of the saw from front to back is very short; or, in other words, the saws are as narrow as it is possible to make them. The advantage of this make and the difference of thickness in back and front is, that the saws will go more easily and more rapidly through the wood than the ordinary fret saws, which are equally thick at back and edge. The effect, indeed, is the same as that which is produced by bending the teeth of a hand saw or tenon saw with a saw set or hammer; for the opening of the teeth produces a wider cut—wider, in fact, than the thickness of the blade, which is thus enabled to pass through the wood without encountering any appreciable resistance from friction. The narrowness of these saw blades also enables operators to turn the corners of any design more neatly and quickly, and without breaking the saw. The saws are made in 8 sizes, numbered from 2/0 to 6, and are sold at 4d. per dozen, or 2s. per gross. I have also received from Mr. Zilles his new description of illustrations in List 20, cancelling No. 12. This contains a selected list of the seven hundred and twenty designs kept in stock by Mr. Zilles, giving in a small compass the numbers and subjects of those which can be specially recommended for general utility combined with artistic beauty.

FIG. 3.—JAWS OF HOLDER OPEN TO TAKE SCREW.

32. *Booth Brothers' Crispin's Awl.*—Amateurs who can manage to execute for themselves any minor repairs in articles made of leather, such as boots and shoes, saddlery, harness-belts, pouches, and military accoutrements, will find a useful pocket companion in Crispin's Awl, a well-made article, taking up but little room, which is supplied by Messrs. Booth Brothers, *Upper Stephen Street, Dublin*, for 1s. 3d. To soldiers of all arms of the service on a campaign, to sailors at sea, to emigrants abroad, and to volunteers and civilians at home, it cannot fail to render good service in times of need. Its nature will be easily understood from Fig. 1, which represents the handle in section. This handle, which is hollow, and has a cap screwed on to the larger end, after the manner of a tool pad, containing bradawls, gimlets, screw-driver, rose bit, etc., is made of hard wood, and is about $4\frac{1}{2}$ inches long, weighing, with its contents, about 4 ounces. At the smaller end is a short piece of iron, pierced to receive an awl, which is held in place when in use by a screw with a milled head, which is shown in the illustration. Within the handle is a long and narrow reel, round which is wound about 50 feet of waxed linen thread, stout and of the best quality. The reel itself is also hollow, and affords a convenient place of storage for three awls of different sizes, two straight and one bent, and three stout needles of sufficient size to carry the waxed thread wound about the reel. I have never seen a more handy contrivance for carrying out the work it is designed to effect.

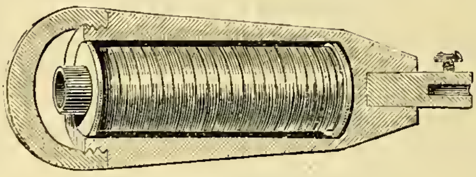


FIG. 1.—BOOTHS' CRISPIN'S AWL.

33. *Booth Brothers' Combined Screw-Holder and Screw-Driver.* Many amateurs, I think, will like to add this Combined Screw-Holder and Screw-Driver to their collection of tools when they remember the difficulty they have experienced in holding a screw—especially a small screw—to the mouth of the hole made for its reception with one hand, while with the other they endeavour to place the end of the blade of the screw-driver into the nick across the head of the screw, and get through all the preliminary work necessary before driving it home. The form of the article is shown in Fig. 2, and from this it will be seen that it consists of a wooden handle with a metal cap at one end, from which proceeds a stout barrel of the same metal with the end of an iron blade and two brass clips projecting from the farther end. In the specimen sent me, which is nine inches in length, the handle is ebonized and the cap and barrel nickel-plated. In the handle, about $\frac{5}{8}$ inch below the cap, is a projecting piece of metal. Press this towards the cap

FIG. 4.—JAWS OF HOLDER CLOSED ON SCREW.

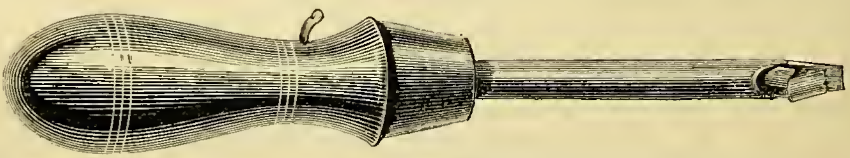


FIG. 2.—BOOTHS' SCREW-HOLDER AND DRIVER COMBINED.

along the slot in which it moves, and the clips will be protruded from tbe top of the barrel on eacb side of the screw-driver, as shown in Fig. 3. Wben in this position a screw may be picked up, the pressure on tbe knob in the handle being relaxed just sufficiently to allow the jaws of the clips to grasp it. Further witbdrawal of the pressure on the knob will draw the nick in the screw-head on to the edge of the blade of tbe screw-driver, as shown in Fig. 4, provided that tbe screw has been taken up in such a manner that the nick is parallel to the edge of tbe blade. If not, a turn of the screw with the tbumb and finger will set it right. The screw in position, its point may be inserted in the bole bored for it without trouble, and driven home as witb an ordinary screw-driver. When tbe screw is about half-way home the jaws sbould be released and allowed to retire to their original position. The return of the projecting button to its place is effected by means of a wire spring coiled round the shaft of the screw-driver within the barrel. Tbis combination tool is supplied by Messrs. Booth Brothers, *Upper Stephen Street, Dublin*, at 2s., 2s. 6d., and 3s. each, from whicb I infer that it is made in *three* sizes, unless the difference in price applies to different degrees of finish. It may be as well to say that the width of the blade of tbe tool sent me as a specimen is $\frac{1}{8}$ inch.

FIG. 5.—MELHUISH'S NEW PATENT SPOKESHAVE.

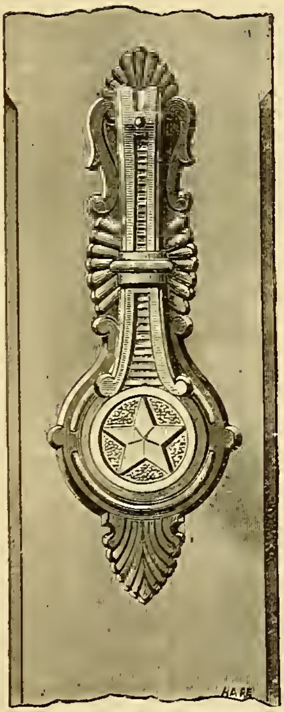


Fig. 6.

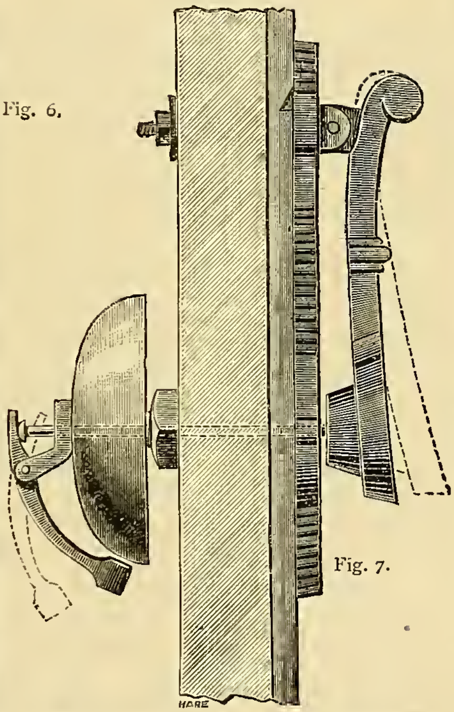


Fig. 7.

FIG. 6.—WAUDE'S PATENTED KNOCKER-BELL—FRONT VIEW. FIG. 7.—SIDE VIEW, SHOWING ACTION OF HAMMER, ETC.

34. *Melhuish's New Patent Spokeshave.* This new tool, which is one of great beauty and excellence of finish, has been sent by Messrs. Melhuish & Sons, 85 *and* 87, *Fetter Lane, London, E.C.* It consists of a steel barrel in the centre, from each end of which projects a turned and polished handle of hard wood, the barrel being about $4\frac{1}{4}$ inches long, and the handles $3\frac{3}{8}$ incbes each—thus making the entire length of the tool 11 inches; the diameter of the barrel is $\frac{2}{3}$ inch. In the centre of the barrel, for about two-thirds of its entire circumference, a portion is cut away, about 2 inches in length, leaving a considerable opening, over which is fitted a concentric piece of steel about $\frac{1}{12}$ inch thick, bevelled on one side to form a cutting iron. While it can be used for ordinary straight work, as thc common spokeshave, it is far better adapted than the tool just named for cleaning off circular work, indeed, thc surface and edges of a circular or oval hole of comparatively small size could be shaved without difficulty with this new form of spokeshave. Its price, I must not omit to say, is 3s. 3d., post free. An illustration of the tool is given in Fig. 5.

35. *Waude's Patent Knocker-Bell.* — It will be remembered by my readers that I gave a description of this uscful appendage to the front door in page 247. Since then I have been enabled, by the courtesy of Messrs. Melhuish & Sons, to give representations of the front view of the knocker on the exterior of the door, and a side view of the article without and within the door showing the arrangement by which the hammer of the bell is raised and brougbt in contact with the bell simultaneously with the blow given with the knocker. The economy of the knocker-bell will be recognised when it is remembered that its adoption and usc does away with the cost of fixing a bell as well as a knocker, but in a different place, which must be actuated separately by two motions of the hand, whereas one only is necessary, to strike the knocker and ring the bell, when the knocker-bell is used.

It is desirable to state that by means of a back plate the bell can be easily fitted to any existing knocker. One desirable feature in the knocker-bell is that the knocker is smaller and less obtrusive than most of the patterns now in vogue, for the knocker outside the door is only $7\frac{3}{4}$ in. by $2\frac{3}{4}$ in., and its pattern, as shown by Fig. 6, is neat and simple. The cost of the knocker and nickel-plated bell is 4s.

AMATEURS IN COUNCIL.

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine, the information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

Organ Building.

A. F. S. O.—For the small organ you describe, the channels should be 1 inch in depth. But there is really no need to take the trouble to make channels at all. Take a piece of sound wood, at least 1 inch thick, and large enough for all the pipes to stand on, with plenty of speaking room, and plane it up, making the underside perfectly true. Then where each pipe is to stand, bore a round hole right through, making each large enough for plenty of wind to pass. Thus, for an 18 inch pipe the hole may be ¾ or 1 inch in diameter. Over the top of each hole glue a piece of ¾ inch mahogany, and then bore a hole through that just large enough for the foot of the pipe to stand in; countersink this hole with a hot iron rod. A small pallet only will be required under each hole. Box the board in so as to form a windchest about 2 inches deep, and your sound-board is complete. The sound-board may be made of any wood that is of good quality and well-seasoned.—M. W.

D. A. W. (*Stoke Newington*).—The first portion of your letter will be dealt with shortly. The specimen of wire enclosed is quite useless for springs, as it is soft wire. The best thing you could get would be some steel wire, such as is used for pianoforte strings, and it should be rather thicker than the specimen enclosed in your letter. —M. W.

Tuba.—Yes, the triangular pieces cut out of the paper pipes where the lips are to be glued on vary in size, according to the size of the pipe. An echo is produced by means of a separate organ, called the *echo organ*, which is placed as far as possible from the main instrument, and is played from a separate manual. In some places the echo organ is situated at the opposite end of the building, and played by means of pneumatic or electric action. Tuba Mirabilis pipes could, no doubt, be made of paper, but they are quite useless for small instruments. As a rule, they are only placed on instruments having at least four manuals. The pipes give out a tremendously powerful sound, and require a wind pressure of 12 or 15 inches. The best reed stops for small instruments are the Oboe and Clarinet, instructions for making which will shortly appear.—M. W.

Amateur Organ Builder.—I am glad you have been successful in constructing your organ, but am sorry that none of my designs suit you. You will, however, please to observe that in my articles I distinctly stated that the designs given were intended to give a general idea of what a case should be, and that they could be modified to suit individual requirements. Tastes differ, and it is impossible to satisfy every one, but I think the majority of people prefer to conceal the swell shutters, and to have the pipes in view, and I fancy few would care to convert their organ case into the semblance of a cupboard, with the swell shutters for its central ornament. The alternate gaping and closing of the shutters would be unbearable to any person sitting in the room while the organ was being played.—M. W.

F. E. K. (*Malta*).—The Kegellade system could be applied to an instrument of five stops, such as you describe, but personally, I would much prefer the ordinary sound-board with channels for any instrument having more than three stops.—M. W.

Voicing Reeds.

J. G. (*Worksop*) writes:—"This is a matter too important to be allowed to rest without further effort. I doubt not scores of amateurs (the writer among the number) are often perplexed how to treat not only the harmonium free reed, but the organ beating reed. Surely some master of the art will be induced to help us, if only by sketches of the best shape and position of the tongue to its frame, in both cases to secure particular results. Many of us know the difference of the modern broad free reed from the narrow reed of twenty years ago, but ignorant of the theory—why?—and any gentleman who could give us an article on the treatment of reeds would surely be of great benefit. A good tuner, as suggested by A. J., p. 95, Vol. IV., is seldom met with in small towns, and in his absence, we spend hours teaching some erratic rebellious reed to speak properly, and fail disgusted at last." [I have just received a paper on the subject of "Voicing Reeds" from the pen of a competent and reliable writer.—Ed.]

Where to buy Violins.

Amateur Violinist.—The best and cheapest (because reliable) places to buy violins are the establishments of the various dealers mentioned by Mr. E. Heron Allen in his papers on "Violin Making." Take your old violin, which is professedly a Stradinarius, to any of these makers, and they will tell you what it is worth, and if it be really what you suppose it to be, namely, a Stradiuarius violin. It does not follow that it is so because the label says so. The cracking of the varnish is in all probability due to other causes than mere age.

Harmonium Building.

Oboe.—(1.) I am not aware that any book is published on Harmonium Building and Repairing. (2.) Kindly send me the title of the work on the organ which you require, and I will then tell you the name of the publisher or publishers.

Index to "Amateur Work."

F. W. (*East Dulwich*).—There is an index to each Volume of the Magazine, but those to Volumes I. and II. are by no means as good as I could wish them to be.

Plan for Bachelor's Sideboard.

Noel.—There is no necessity for a plan of the "Bachelor's Sideboard" in Vol. I., page 376. A perspective view is given of the sideboard complete, on a scale of 2 inches to 1 foot, and from this a working drawing of the front elevation can be prepared, without the slightest difficulty. Elevations, with dimensions, are also given of the right and left-hand ends or uprights, and the smaller uprights in the sideboard which divide the interior perpendicularly into compartments. The bottom of the sideboard, the divisions horizontally, and the shelves are nothing more than rectangular pieces of board, fitted between, and secured to, the uprights; and, as means are given for fixing the length and breadth of these, a plan and sections at different points are not required. I may, however, say that, if I were making this sideboard for myself, I should be inclined to make the bottom in one piece, and mortise the uprights into it, attaching the feet as shown in the engraving, also by mortising. If made as drawn, the horizontal pieces must be tenoned into mortises cut in the uprights for their reception.

Instruction on Wood Engraving.

A. B. H. (*Edinburgh*).—I will endeavour to meet your wishes by giving a series of papers on this subject in Amateur Work, as you give the best of reasons why the information would be useful to yourself, and probably to many others in a similar position.

Stanmore.—I have made application to a skilled engraver for a series of papers on this subject.

Gas Engines.

A. Y. S. (*Waterford*).—A gentleman of considerable experience has volunteered to write on this subject, and his offer has been accepted; but I cannot say how long it may be before the first paper appears, as I have had no "copy" from him as yet. Meanwhile, I think it would serve your purpose to write to Mr. A. H. Shipman, *Rochester, New York, U.S.A.*, for a prospectus of the "Shipman" Steam Engines, which are worked by petroleum as fuel, and are made as stationary engines for applying motive power for lathes, etc., and reversible for propelling pleasure boats. Gas engines are costly, expensive to work, and can only be worked where gas can be had. These steam engines, however, can be worked anywhere and everywhere. No. 1, for foot-power machinery, complete in running order, costs 50 dollars, or £10.; No. 2, suitable for boat purposes, 100 dollars, or £20.

Opifex.—See reply recently given on this subject to A. Y. S. (*Waterford.*)

Worms in Beech Wood.

W. H. E. asks:—What is the best way to get worms out of beech wood? To this I must reply, see, "Hints on the Restoration of Antique Furniture," in page 348, Vol. I. of this Magazine, in which instructions are given on this subject.

White Moth.—The preceding reply to W. H. E. will afford an answer to your inquiry respecting the destruction of worms in old furniture. The smell of creosote is far too lasting to render it desirable as a cure, however efficacious it may be. Petroleum is destructive of insect life, and the smell soon goes off. It will be safe to follow the advice given on "The Restoration of Antique Furniture."

Repairing Jewellery.

K. A. T.—For repairing jewellery and ornaments of any kind, apply to Mr. J. W. King, 15, *St. John's Square, Clerkenwell, E.C.* The second subject on which you write cannot be dealt with in these pages.

Willesden Waterproof Paper.

ENQUIRER writes:—"I should like some particulars about the Willesden Waterproof Paper, and its adaptability for boatbuilding; such, for instance, as the lengths, breadths, and thicknesses in which it is manufactured, its flexibility, whether it takes a plane, is liable to split, its cost, etc. I was thinking whether I could utilise it in making a canoe of the Nautilus type—a 'paddling sailable'—one on the ribband carvel plan. A short time since, I completed a 'sailing paddleable'—one all by myself—and it has been a great success, though it leaked a great deal at first. The only misfortune is that, following a friend's advice, I coated the inside with pitch, which was not only useless, but also rather a disfigurement, and a couple of coats of varnish would have been infinitely more to the point. However, 'experience bought, etc.,' and as she does not leak a drop now, I don't care much about the look." [Can anyone who has had practical experience of the Willesden Waterproof Paper satisfy ENQUIRER's queries, especially with reference to its utility as a material for boatbuilding?—ED.]

Model Engine and Boiler.

S. M. L. (*Goderich, Canada*) writes:—"May I ask A. F. S. (*Dresden*) from whose catalogue I can obtain designs of Compound Condensing Screw Engine for Model Launch? After stating that model (compound condensing screw engine) *will not work*, he refers me to catalogues for the kind of engine I want. Now, I have about six catalogues of prominent makers, but in none of them (save one) is any reference made to Model Compound Engines. The one exception I refer to is a maker in the North of England, who advertises a model at £50. Engine is ¾ feet to 1¼ feet, 1½ feet by 1¼ feet, without boiler; surely this model *must work*, else why charge such a price? A. F. S. also states that I can find designs of boilers in catalogues. True, as far as exterior views of same are concerned, but no information as to the interior of boiler is given, and this is what I wanted." [If any reader will send me a sketch of the interior arrangement of such an engine as S. M. L. requires, I shall be glad to give publicity to it, with A. F. S.'s reply respecting the catalogue.—ED.]

Headstock for Lathe.

SIGMA.—If you will repeat your question on the subject, I will get it answered for you, and by doing so, endeavour to remove the disappointment you have experienced from J. L.'s answer to your application. I can put you in communication with a first rate pattern-maker, if this will be of use to you.

Patterns of Plane.

IOTA writes:—"Having made a plane similar to that described in page 28, Vol. III., of AMATEUR WORK, I shall be pleased to lend the pattern to any *bona fide* amateur who would care to have a similar tool. The one I have made works splendidly, and I advise all my amateur friends to make one without delay. They will soon find out 'why.' Mine is cast in gun-metal. If the Editor will kindly make this known, I shall be glad to forward the pattern—sender paying postage only." [Amateurs wishing to borrow pattern must enclose application with stamp in an envelope, also stamped, and marked IOTA in lower left-hand corner. The Editor will then address and forward letter to IOTA.—ED.]

Substitute for Screw Press.

T. S. writes:—"In the sketch of the above ingenious article given in page 203 of the present volume, WAITO has obviously made a slight error by showing the wedge C, Fig. 2, at right angles to the work D, instead of parallel to it. I enclose a tracing of the sketch, showing the correction. It would be well not to let the wedge bear directly upon the work, and injure the edge, but to interpose a piece of spare wood. I would suggest as an improvement that the upper pin, B, and the wedge, C, should be discarded, and that the female screw of a small hand-cramp should be fixed by screws at the upper end of the inside face of one or the other runner. The male-screw working through it would then be brought to bear upon the work, as shown by the accompanying diagram (Fig. 1). The tendency of the runners to bulge could be obviated by tying a piece of cord round them at A, A; or, if this were thought undignified, a

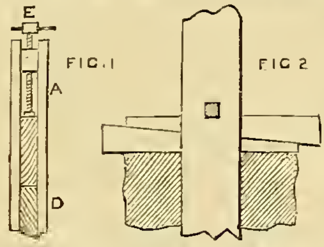


FIG. 1.—HAND CRAMP FOR WEDGE IN SUBSTITUTE FOR SCREW PRESS. FIG. 2. — WORK LOCKED IN PRESS BY DOUBLE WEDGE.

hand-clamp could clasp them at the same part." [The error noted above will be obviated by removing the portions of the wrongly-drawn wedge that project to right and left of the runners, A, A, in Fig. 2. A piece of spare wood might be interposed between the wedge and the work, to prevent injury to the edge of the latter, but this and the substitution of the hand-clamp for the wedge, which you suggest above, but which would detract from the simplicity of the contrivance, might be dispensed with by having two wedges, instead of one, driven in contrary directions, as shown in Fig. 2. By this means the lower wedge acts as a safeguard to the edge of the work, and perfect parallelism is preserved between the upper edge of the work and the lower edge of the topmost pin, which, for obvious reasons, would not be attained if a single wedge were used.—ED.]

Amateur's Work Shed.

R. G. (*Birkenhead*).—You have done a great deal of good work under difficulties that would have stopped many. You will find directions for making sheds in "Every Man His Own Mechanic." Rather than make a shed in the yard, however, if your income is sufficient to enable you to live by yourself, I should advise you to take unfurnished rooms, and make furniture gradually for them, according to the instructions given by Mark Mallett in "My Furniture, and How I Made It." If it is necessary for you to remain with your friends, and you still wish to build a shed in the yard, which can be taken to pieces when necessary, I would recommend you first to make a platform on stout sleepers, and then to make the front, back, and sides in compartments, bolting the skeleton frames to the floor and to each other with iron bolts and nuts, and then attach the roof in the same way. When the compartments are fixed, cover them externally with feather-edged boarding or corrugated iron, and line the structure with match-boarding. Fix every piece with screws, well greased and countersunk, so as to bury the heads in the wood, outside, if you use feather-edged boards, and coat over with putty. By adopting this plan—and screws are cheap enough when bought by the gross—you can strip the building of its covering and lining whenever you will, and then take the framing apart. As I do not suppose your shed will be very large or very high, you might light it with a skylight, made after the fashion of a light for a garden frame. Surround the roof with a gutter, and carry off the rain with a down pipe. Also, nail a slanting piece of board round the bottom, just above the platform, to shoot off water that may fall against the sides. If there is any thing else you wish to know, write again, and I will do all I can to help you.

Dealings with Tradesmen.

A. Y. S.—I am inclined to think that the non-receipt of a reply to your letter to the tradesman you mention was in a great measure your own fault. It is unlikely owing to the number of customers that he has, that he would remember having had previous dealings with you, and as you sent no stamps he would naturally view your application with suspicion. Whenever you write to a tradesman for goods, especially anyone whose name and address is given in these pages, remit cash to show your *bona fides*. If too much, he will return the balance; if too little, he will write to you and apprise you of the fact, or send the goods, trusting to you to send what still remains due. One is obliged, you know, to be always on the *qui vive* in these days of post cards and parcel posts. I am obliged to you for your offer of sketches, *re* Microscopic Camera and Picture-Frame Making.

Printing in Gold.

A. L. B.—For printing on satin from type you will require gold powder, for which, and special directions for the manner in which it is to be applied, you can apply to Messrs. C. G. Squintani and Co., 3, *Ludgate Circus Buildings, London, E.C.* For printing on morocco leather, see directions given in Vol. II., page 458, of this Magazine.

Where to Buy Type.

J. W. W. (*Plaistow*).—The best place at which to buy type in small quantities, as far as I know, is at 3, *Ludgate Circus Buildings*, where you will find Messrs. Squintani and Co., who provide everything in the way of printing outfit required by an amateur.

Graph Composition.

J. G. (*Worksop*) writes :—"I have twice refilled my graph with the composition, excluding the Paris whiting, furnished by R. S. (*Nottingham*), p. 48, Vol. II., and with the greatest satisfaction."

Tool Grinding for Amateurs.

PITCHPINE writes:—"May I take this opportunity of recommending your readers, who live out West, to Mr. House, *The Parade, Shepherd's Bush.* It is the only place that I know of out here where I can get tools thoroughly well ground. Being a practical cutler, he thoroughly understands the work, and if told the kind of work for which the tool is going to be used, will suit the angle of the cutting edge to that work. He also sells tools at a very moderate price, and will do any kind of lathe work (metal). You have only to mention that you are an amateur worker to receive every attention."

Narrow Gun Barrel.

E. W. (*Richmond*) writes :—"Judging from MERCURY ORKNEY's description, page 204, there is no fault in his gun barrel. Shot guns are usually enlarged towards the muzzle in order to produce a good 'pattern' in the shot. They are also enlarged towards the breech to increase the force of the powder. Whether this shall be done in either or both cases, and to what extent, depends on the judgment of the gunmaker. Of course, MERCURY ORKNEY'S gun may have been badly bored; but the mere fact that it is narrow in the middle is no evidence of it."

Test for Square.

E. W. (*Richmond*) writes :—"In page 198, a novice is recommended to test a square by applying it to both sides of a piece of wood, 'whose edges are truly parallel.' As such a piece of wood may not be at hand, may I point out another test, which is equally efficacious. Apply the square to the straight edge of a board, with the stock to the left hand. Apply it to the same point with the stock to the right hand. In both cases draw a line along the edge of the blade. If the two lines coincide, the square is true. See Euclid, Book I., Definition 10."

How to use French Polish.

W. H. E.—You will find all the information that can possibly be given on this subject in the series of articles entitled, "French Polishing in all its Branches," which appeared in Vol. III. of this Magazine.

Ebonising Wood.

VICAR writes :—"Allow me to recommend Flack's Ebonite French Polish and Spirit Varnish, price 1s. 3d. per pint; address is, 75, *Blackman Street, Borough.* All his preparations are excellent."

Cutting Mounts.

SUFFOLK WOODLANDS.—An article on cutting mounts, giving all particulars as to tools, materials, and manipulation, is in preparation, and will appear shortly.

A. W.—Kindly refer to the reply already given to SUFFOLK WOODLANDS as above.

Address Wanted.

T. C. (*Aldershot*).—If you will forward me a stamped envelope addressed to yourself, I will send you a letter that I have received from E. P. for you.

A Cheap Astronomical Telescope.

J. N. H. D.—If you will turn to page 393, Vol. III., you will see it there stated in the first column, "Remember this telescope will not do for terrestrial objects, as the image is presented to the eye in an inverted position." If, however, you do not mind the rather anomalous picture of trees growing downwards, and houses standing on their chimney-tops instead of upon their foundations, of course you can use it as much as you please, in daylight as well as in starlight. By using what is called a terrestrial eye-piece, objects may be made to appear in their proper position; but as my subject was an astronomical, and not a terrestrial, telescope, I did not enter upon the construction of the latter instrument. It would take a paper for itself; but at the present I do not see my way clear to undertake it, even though the Editor had space for it, which he has not.—F. A. E.

Rendle's Electric Paint Remover.

G. J. D. (*Cheapside*) writes :—"In page 198 you publish a letter from NOVUM SARUM, condemning the above preparation, and you ask for the experience of your readers. Some two years ago, a lady wrote to me, asking if I could tell her how to remove some old paint from (I believe) a stone staircase. I sent her Part 2 (Jan. 1882) of AMATEUR WORK, marking in page 94, in 'Notes on Novelties,' the passage relating to 'Rendle's Paint Remover.' In a few days I received the copy back, with many expressions of thanks, the 'Paint Remover' having proved a most complete success."

Toy Electric Bells.

C. S. (*Kirkcaldy*).—The advertised address of the "Economical Electric Supply Association" is *Wood Green, London, N.* I have no practical knowledge of the toys supplied by this Association, so cannot recommend them.—G. E.

Gold Solder.

W. A. P. (*Windlesham*).—By consulting the series of articles on "Brazing and Soldering," recently published in AMATEUR WORK, you will learn how to melt any variety of hard solder. Read those articles through carefully; then tell me the kind of solder you wish to use, and all about the process adopted by you. I may then be able to help you out of your difficulty.—G. E.

Granule Battery.

TELEGRAPH.—The granule battery is, as you state, somewhat troublesome to clean and re-charge. But I fear that you will find the task of casting all the carbons in a ring of lead by no means an easy one. I use only three carbon blocks in each cell. Each carbon has a lead head cast on it, as the carbons for a Leclanche cell, but only one of the three has a binding-screw—the other two are furnished with a length of stout copper wire soldered to the lead. All the lead heads and their wires are protected with Brunswick black, and the three carbons are connected together. I pack the cell with best gas coke, but rough pieces of retort carbon would be better. If you use carbon blocks, seam them well with an old file, and thus make their surfaces rough before they are used. Better still, get some corrugated carbons from Mr. R. Applegarth, *Atlas Works, Ewer Street, Southwark Street, London, S.E.* You can then dispense with granule carbon. As the reply to your last query must be based on a knowledge of the conditions surrounding your arrangements, I cannot say how long the battery would furnish you with light without being re-charged.—G. E.

Bookbinding.

W. H. D. asks how to square, or, to use the proper term, to throw up his fore-edge after backing, so as to enable him to cut it flat by the machine. He will not be able to do it. His only way, and the plan adopted by the trade, is to cut the fore-edge in the flat, then round and back afterwards. If he rounds and backs his books properly, the rounding in the fore-edge should be correct. His admission that the concave is not correct says at once that he has not rounded his book properly; this he will only get by practice. But why not get a small plough, and cut his own books?—AUTHOR OF "BOOKBINDING FOR AMATEURS."

Indiarubber Bands for Gearing Slide-Rest to Mandrel.

OLLA PODRIDA writes: — "Under this heading, at pages 45 and 204 of the present volume, A. F. S. (*Dresden*) makes certain remarks upon the relative qualities of home and foreign work. In doing this, he speaks disparagingly of English machines, but as he refers only to 'cheap' goods, his opinion is obviously of little value. Such classes of goods are made in all countries, and specially designed to meet the wants of people of his stamp. There is no universal fixed price for lathes. The price varies with the size—and the buyer. I have no intention of entering into an argument on this matter with A. F. S. I only wish to draw the attention of our readers to the glaring inconsistency of the statements made by him. At page 45, in speaking of German work, he informs us that 'it is far from being cheaper than English.' At page 204, he poses with a new and diametrically opposite version, to the effect that 'it seems to be impossible to get a really good lathe in England for less than £80, the same lathe costing £40 here' (Germany). Such a reckless correspondent as this is beneath notice, his remarks barely meriting even the expenditure of contempt. Anent 'free trade' in labour, the Editor's remarks in parenthesis are to the point, and that they are correct I have proved from experience with such immigrants."

Artistic Modelling, etc.

L. C. (*Putney*). — The papers entitled "Artistic Modelling and Amateur Sculpture," by Mark Mallett, are to be found in Parts 15, 16, and 19 of this Magazine.

Folding Camera Stand.

BLACK DIAMOND.—Mr. Pocock describes this appliance in this Part. You must make your own grooving for the dark slide described by him; but you can purchase grooving, ready made, of Lancaster, for ordinary dark slides, etc. I cannot say whether or not Mr. Pocock will describe "a whole plate camera on the principle of Lancaster's Instantograph" at some future but such an appliance will not be in his present series of papers.

Rotary Nuts, etc., etc.

A. F. S. (*Dresden*).—I must endeavour to answer your latest queries myself; or, rather, to touch on the various points mentioned in your letter—for I am sure, before I begin, that the replies I shall give will utterly fail to satisfy you. First of all, the columns of AMATEUR WORK never contain anything that is "really nothing more than abuse," and OLLA PODRIDA is never abusive, and never writes "tirades." He writes and speaks plainly and to the point, and, as he ought, he never shrinks from saying what he means. You say that you have written to a well-known firm of tool-manufacturers on the subject of rotary nuts, and received no reply; further, you say that you "wrote to the 'English Mechanic,' and they could not tell you more than you knew already;" and that five years ago you "went to Holtzapfel's, and inquired for some other arrangement that would do away with clutch-nuts, etc., and he could not enlighten you." Now, if the well-known firm of tool-manufacturers, the "English Mechanic," and Holtzapfel, individually and collectively, have failed to satisfy you, I am sure that OLLA PODRIDA and I should utterly fail also were we to spend days and nights in endeavouring to do so; and, I may also add, that when we consider the excellent authorities that you have consulted without effect, we are not such fools as to care to rush in where angels fear to tread. In plain words, I think that whatever we might say would fail to satisfy you, and therefore we decline to attempt it. Next, as to shapers. You say that in 1879 Churchill "offered you a shaping-machine — the smallest they had — weighing over 100 lbs., with a stroke of 6 inches, for £20." And cheap enough, too, I should think! You cannot have costly tools for next to nothing, and you must pardon me for saying that this seems to me to be your great aim and ambition. Skilled workmen cannot work for nothing—will not work for nothing, or for unremunerative wages—whatever they may do in Germany, and they are right. For myself, I back English workmen and English-made tools against the world, Germany not excepted. You then continue: "As OLLA PODRIDA seems to know all about German tools, perhaps he will kindly tell me how a 'new' self-centring chuck, invented here three years ago, is worked. It is kept somewhat secret here, so I cannot find out. The chuck has three or four jaws which swing round to the centre in the manner of a lock-gate. The jaws are massive steel forgings, and constitute a far stronger, steadier chuck than the scroll-chuck. The jaws are worked by a key, but how are the jaws locked when in position? *I want to know all about it. I don't like buying things without knowing anything about them, especially as these chucks are fearfully expensive.*" Exactly so; and herein is the whole gist of the matter, as far as I can see. Buy one, and you will soon find out all about it. When I want to know how a tool or appliance works, I find I can always get all the information about it that it is necessary for me to know by calling on the manufacturer or any vendor of the tool, and asking them to explain its action. I should do the same if I were in Germany, and, I am sure that even a German maker, if approached in a proper manner, would do precisely the same as an English maker would—namely, answer all fair questions fairly put. Next, we come to the matter of hexagonal wire nuts. You request me to thank MODEL for the information he has supplied, but you continue, "I fear the plan is too slow. My lathe is different. I have 1½ inch between headstock and pinion." Here we are again! as the clown says in the pantomime. You "*fear*," etc. Have you *tried* MODEL's suggestion? I guess not. You ask for bread and butter, and, when it is handed to you, you do not care for it. You see I am compelled, *nolens volens*, to go into the "tirade" business. Now for the next item. You say, "As regards the cost of labour in England, I know little about it; but I do know that one has to pay 9s. a day here for a fitter." Fitters' wages here are 6s. per day; but I did not know that the shilling formed part of the German currency. Next you ask: "Can you enlighten me in bookbinding? I want to bind about five (why about?) volumes of 'English Mechanic's' (*sic*). I am puzzled about the outside covers. Does one take off the outside covers and next piece inside, or bind them just as they are?" I presume you are referring to the weekly numbers. With regard to weekly numbers of any serial publication, if the pagination is consecutive throughout, from the first page, of what you call the outside cover, to the last, you *must* bind them just as they are; but if this outside cover and the "next piece inside" is paged in Roman numerals, separately from the pages within, which, on the contrary, are paged in Arabic figures—this is done to separate the pages devoted to advertisements from the pages devoted to the text, and to give you the option of removing the former if you do not care to retain them. Lastly—how thankful I am that I can at last write "lastly"—you ask, "Can you help me in the pattern-making line?" To this I reply that I have sent your query to one of the best pattern-makers in England, and I am sure that if he *can* help you he will readily do it. I do not know, however, what he will say to the conclusion of your letter, which runs thus: "I make my patterns with the prescribed taper of one in ten, but, notwithstanding, the moulders are never satisfied, though, as a matter of fact, I have had patterns made by pattern-makers, and still the moulders make a fuss. *What the matter is I can never make out, unless it is that they are angry at not being employed in making the patterns.*" I dare not permit myself to make any comment on this.—ED.

Photographing Landscape.

JACK LEIGH. — You could not take a view of two or three miles in extent in England, in a satisfactory manner, from the top of a hill—you would require some prominent object in the foreground, and the view would form the background, falling altogether into a second place, as compared with the foreground. Professor Smyth, in one of the photographic almanacks, describes views of a hill taken at a distance of two or three miles, in which every stone was shown sharp and distinctly, but that was in the Island of Teneriffe. As to the best lens, that depends upon the amount you are disposed to spend. Lancaster's view lenses are cheap and good at the price; next comes his rapid rectilinear, but the best lens for general use would be a rapid or portable symmetrical or rectilinear by one of the first makers, as Ross or Dalmeyer, costing £3 10s. to £5.—J. P.

Binding "Amateur Work."

JACK LEIGH.—You may have your folding-sheets backed with thin muslin to strengthen them. The plates that are equal in size to *two* pages of the Magazine may be inserted by the binder on guards to face the articles in which they are described. The larger folding-sheets are more conveniently kept in a pocket at the end of the volume, formed by flaps of cloth attached to the edge of the cover, and folding inwards.

Designs for Entrance Gates.

NEMO.—I am not acquainted with any published designs that may exactly suit your requirements. Two or three are given in "Every Man His Own Mechanic," and very many have appeared in the "Illustrated Carpenter and Builder." It might be useful for you to look through the volumes of that publication, with the view of selecting a design that may be suitable.

How to Turn Pipe.

J. M. H.—You will find a description of the method to be adopted and the appliances to be used in turning a wooden pipe in Vol. II., page 298, of this Magazine.

Treadle Fret-saw.

J. W. (*Neasden*). — If you will look through the parts of AMATEUR WORK already published, you will find among the articles that they contain, and in "Amateurs in Council," much useful information on the construction of treadle fret-saws.

The Primitive Lathe.

W. J. R. E. (*Rushden*).—The lathe you describe is the old pole lathe, and, as it is well known, I do not insert your description of it, though I am obliged to you for taking the trouble to send it. The account of which I termed "The Primitive Lathe" was inserted to show with what simple and elementary appliances a willing workman could turn out decent work. I will point out the "sin of commission," of which you complain to the correspondent who has been guilty of it.

Barbotine Ware.

W. T. B.—Earthenware pots for making imitations of Barbotine Ware are generally to be purchased of dealers in fancy goods. I cannot direct you to any particular vendor, but perhaps some of the readers of AMATEUR WORK can do so.

Lathe Chuck.

WORKING CORRESPONDENT writes:—"In your last you gave a very ingenious receipt for making a lathe chuck. But I must confess that I have found it impossible to make it run true for any length of time; and, as time is money to me, I was obliged to buy one of the Britannia Company's Essex Chucks, at 10s. 6d., which holds any drill. I shall be glad to hear if anyone else has had more success than I have. If a chuck won't remain true it is a nuisance."

The Cabinet-Maker.

D. B. A. writes, in reference to the qnery of F. H. (*Clifton*), page 20I:—"'The Cabinet-Makers' Guide' and 'The Cabinet-Maker and Art Furnisher' are two distinct publications. I have not seen the former for some years, and I write from memory about it. It was pnblished in two parts, at, I think, 2s. each, the first containing a variety of information about wood-working, and the second principally polishing and sundry receipts. It was by someone named Bitmead or Bidmead. I am under the impression that it was also published by him in the neighbourhood of the Euston Road." [Through the kindness and courtesy of G. H. M., a gentleman, who has forwarded me his copy of the work in question for inspection, I am enabled to give its full title, which is: "The London Cabinet-Makers' Guide to the Entire Construction of Cabinet Work, and the Art of Laying Veneers of all Kinds by the most approved and quickest methods; also, Marquetrie, Buhl-work, Mosaic, Inlaying, etc., and the Working and Polishing of Ivory. With Instructions for Dyeing Veneers any Colour throughout their Entire Thickness, Valuable Recipes, New Tools, New Cabinet Woods, etc. Copiously Illustrated with Plans, Sections, and Working Drawings. By Richard Bitmead. London: Published by the Anthor, 110, Euston Road, N.W." The date appended to the preface shows that the first part of the book was published in October, 1873. The second part was published by the anthor at 12, Argyll Street, Argyll Square, W.C. The entire work comprises 98 pages, demy 8vo. It is illustrated with 49 diagrams and explanatory working drawings. It conveys much useful instruction iu a clear and intelligible form, and contains information and recipes that cannot fail to be of groat use to the amateur cabinet-maker.—Ed.]

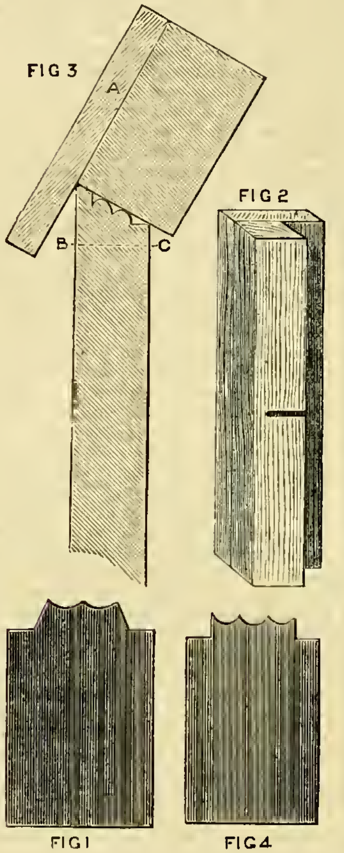
Pitchpine writes:—"In reference to your reply to F. H., in p. 20I, Vol. III., I think, perhaps, F. H. is thinking of a hook written by a working man, and published by Wyman and Sons at 4s., eutitled, 'The Practical Cabiuet Maker.'"

Hydraulic Motor.

A. J.—You will find instructious by Cato for making a Hydraulic Motor for Amateurs in Vol. III., page 502, of this Magazine. The motor described is made of wood, and certainly affords power enough to drive a small circular-saw.

Mouldings for Panels of Etagère.

C. T. S. (*Didsbury*) writes:—"Yonr correspondent H., in page 203 of this Volume, may be interested to learn how an amateur overcame the difficulty of making small panel-mouldings for a cabinet by means of a router or scraper. To make the scraper, take the blade of an old kitcheu knife, and, with a file, cut a bit ¾ inch wide ont of the centre of it; then, with small files, form the curves, to cut the quirks or beads, on what was the sharp edge of the knife, as Fig. 1, finisbing the sharpening with an oil-stone slip. A stock to hold the scraper must be made out of a piece of hard wood, 8 inches by 2 inches by I inch, and the scraper wedged into a saw-cut, iu the centre, as in Fig. 2. Take another piece of the same wood, about ¼ inch thick, the same length of the stock, but ⅜ inch deeper, and screw it on to the side of the stock, to strengthen it, and also to form a fence, as shown at A, Figs. 2 and 3. The stock and fence may be made ont of one piece of wood, but the scraper is more easily adjusted or removed by having them separate. For a ¼ inch moulding, take a ⅝ inch plank, sufficiently long to make the



ROUTER FOR SMALL MOULDINGS.

Figs. I, 4.—Steel Scrapers. Fig. 2.—Perspective view of Router, showing groove for Scraper. Fig. 3.—End Elevation of Ronter, and mode of using it. Figs. 1, 3, and 4 are full size.

entire mouldings for a panel, and, having carefully bevelled the edge with the shooting-plane, fix it in the bench-vice, and work the scraper in the direction of the grain of the wood, holding the stock in the position shown in Fig. 3, which gives an end view of stock with scraper forming the moulding on the edge of the board. When the scraping is finished satisfactorily (after, at first, many failures), saw the moulding off the board at B, C, and on the shooting-board plane up the two flat sides till one of them is the required depth of the moulding. By substituting the three-bead scraper (Fig. 4) for the monlding-scraper, tbe front edges of sbelves and uprights of small cabinet work may be beaded in the same way, before the various pieces are put together, tbe position of tho stock in this case being, of course, perpendicular, *i.e.*, not on the bevel. Minute beadings may also be worked on flat surfaces, such as the stiles and cross-rails of small cabinet doors, by the same stock; bnt in this case the fence must be removed, and a guide fastened along cach piece to be worked upon (by means of screws at each eud) to form a fence, as the scraper will not work smoothly, unless it be close to the fence." [With the above communication, C. T. S. sends some excellent specimens of work executed with a router or scraper such as he describes. These prove him to be a workman of considerable skill and resource iu himself. I will forward the specimens to H., on receipt of his name and address, and two penny stamps for postage.—Ed.]

Finsbury School of Practical Amateur Mechanics.

Mr. Thos. Syer, the Principal of this excellent school, writes:—"If any readers of Amateur Work have been disappointed iu not receiving a prospectus of the above School, and in some cases may havo had their letters returned to them as unknown, I have to explain that tho person who usually empties the letter-box at the above address (viz., *No.* I, *Finsbury Street*) has, I believe, sent those back which were addressed Mr. Crowhurst, saying, 'not known.' I here beg to apologise to any readers who may have been served thus, and to ask all who wish to make inquiries respecting the above to address their letters to Mr. Syer, at *No.* 1, *Finsbury Street*, or to Mr. Crowhnrst at the School workshops, *Finsbury Square Buildings, Chiswell Street, E.C.*; in either case they should be under the care of T. Syer, and they will then receive their answers in due course. I trust that this explanation will show that tho 'Finsbury School of Practical Amateur Mechanics' is still open, and ready to receive any person desirous of becoming a student."

Lathe Making.

Truly Rural.—(I.) If you wish to make an iron lathe, you will find a series of papers on the subject, by the Rev. James Lukin, running through all the Parts of Vol. III. of this Magazine except one. (2.) For castings and prices apply to the Britannia Compauy, *Colchester*, or any of the engineers whose names are mentioned, or who advertise in our pages. (3.) If you desire to make a wooden lathe, a series of papers on this subject by Olla Podrida will be commenced shortly in the present volume.

Curing Skins.

Truly Rural.—Information on the Preservation of Skins of Birds and Animals, and How to Stuff Them, will be found in pages 466 and 507 of Vol. III. of this Magazine, and additional instruction on Curing Moleskius will be found in page 439 of the same Volume. See, also, pages 98 and I50 of this Volume.

Lathe-Bed as Surface-Plate.

H. W. (*Newton Abbot*) writes:—"I find, for all small work, and especially with the scribing-block, the lathe-bed is sufficient for this purpose."

Surface-Plates.

Olla Podrida sums up the discussion on the above with A. F. S. (*Dresden*) as follows:—At page 439, Vol. II., A. F. S., in comment upon A. C. (*Bristol*), states that he has "*two* plates," and that "two plates are necessary to make a surface-plate." In my comment upon this statement, at page 545, I informed him that *three* plates were necessary, and that it was impracticable to accomplish it with two plates only. This was followed by some quibbling nonsense, to be found in page 594. I replied to this at page 148, Vol. IV., and asked A. F. S. how he *assured* himself of the truth of his plates. This he has not as yet answered, but, in what I take to be meant for a reply at page 204, he gravely informs me that he keeps "*one*" plate "sacred," and speaks of the other "*plates*" that were used in grinding this "sacred" one. This implied plurality of more than two was evidently not in existence when, out of his abundance, he corrected (?) A. C. (*Bristol*), and yet A.F.S., with cool audacity, accuses me of not being able to "take in" the "fact" of its "sacred" existence. It would be difficult, indeed, to have done so, unless gifted with some of the rare omniscience seemingly possessed by our doughty man of words (?). I must tell him plainly that I have not "taken in" that particular "fact" yet, nor am I likely to do so in the face of his former statements, the first of which—Vol. III., page 439 — was voluntary on his part. Strange that the aforesaid plurality did not increase till after my comment in page 545. At page 204, Vol. IV., A. F. S. proceeds to accuse me of saying one thing and meaning another when speaking of scraping. No such thing, A. F. S. What I said I *meant*. A spade is a spade with me. People living in houses of glass should never throw stones, A. F. S. This discussion, although obviously unprofitable, and little else than a waste of space, has nevertheless fully convinced me that the knowledge possessed by A. F. S. about surface-plates is extremely limited, and absolutely worthless. The bare fact of his advocating grinding shows this, and the fallacy of grinding is proved from his own remarks, when he says, at page 439, that his plates will "adhere together when dried," and at page 204, the "other plates" are "not very true." That being so, then, how in the name of common sense does he obtain truth in the "sacred" one, which, of necessity, must partake of the state of the plates used in grinding it; and that it does partake of their state is proved by their adhering together when "dried." If the surfaces didn't correspond they wouldn't adhere in a dry state. And on his own statement, that the "other plates" are "not very true," it follows that the "sacred" one cannot be "very true," either. As I have already stated at page 545, *scraping* is the only medium through which a true plane surface can be obtained. Grinding is a snare and delusion. Hence one of the objections to surface-plates of glass. There are, also, other practical objections to glass plates, which prevent their favourable adoption. I do not consider it necessary to detail them here, as the subject cannot possess any great interest to the amateur, and certainly none to A. F. S., unto whom I must intimate that any further correspondence on this subject will be treated by me with silent contempt. I am always ready and willing to do all that lies in my power in furthering assistance to those in need, but, at the same time, expect, in common with others, a little courtesy in acknowledgment. Common civility is cheap, and goes a long way. To have the practical experience of years catechised and queried by a narrow, opinionated question-monger, is one of the last straws.

To Clean Marble.

B. G. (*Limerick*) sends the following recipe:—Take 2 parts of common soda, 1 of ground pumice-stone, and 1 of powdered chalk. Sift through fine sieve, and rub over marble. Wash off with soap and water.

Model Engine Making, Lathe Building, etc., etc.

A. F. S. (*Dresden*).—When you put a plain and intelligible question, to which a plain answer can be given, that answer will be cheerfully given by some contributor on the staff of Amateur Work, or myself; but I must decline, for the future, both in their behalf and my own as well, to entertain such letters as I receive from you. I have two long letters from you now before me, bearing date Feb. 16 and 17, which are as full of queries, thoughts, suppositions, ifs, and intentions, as a hedgehog is full of bristles. To attempt to give you even a tithe of the information you apparently seek would take far more time and space than can be afforded to you, because every particular, so erratically put in your letters, would have to be examined and commented on, and even then, the work in all probability, would be of no service, either to you or to ourselves, because we cannot determine precisely and specifically what you want, and because we might reasonably fancy that you mean one thing, whereas, as your letters give evidence, you really mean something that is entirely different. Olla Podrida has done his level best to help you in the matter of paint for model engines, but he has been as powerless to satisfy you as the engine-painter who told you some years ago that you could have any colour you liked, as it is the varnish that is required to withstand the heat, and whose statement you now begin to doubt. In this, then, we shall do no more. Neither can we help you in your model of a "Goods Loco Six-coupled of an Austrian line," but must leave you entirely to your own devices, which are somewhat peculiar, if we may judge from the following statement: "The drawings are drawn for the full-sized engine, excepting I have put 20 tubes instead of 215, and made a *slight* alteration in the cylinder—namely, casting on the two sides of valve-chest only, leaving out the front and steam-pipe in consequence of a foundry fuss." And yet you are seeking—unless we are all mistaken—to make a working model. Again, Mr. Lukin has endeavoured to help you in lathe-making, to the best of his ability, but it seems that you have asked how to make the parts of a lathe of a certain size, and cannot carry out his suggestions, because your own lathe is not large enough. The only remedy, as far as I can see, is to get a lathe that is large enough, a conclusion to which you might have come for yourself. Once more all has been said that can or will be said about hexagonal wire, so we shall let alone for the future this item of the vexed questions which you bring before us. If you have advertised for hexagonal wire, and received no answer, we cannot help it. But then, immediately after telling me this, you say, "If I take hexagonal wire, I must have not less than eight yards." Does not this imply that you can get it, and know where to get it, but do not care to buy so much as the quantity named, which ought to be no great matter to you, as you "don't want to buy bolts and nuts by the dozen, but by the pound," for "a gross soon disappears." . . . Your letter ends thus: "Do not take offence, none is meant." I am perfectly sure of that, and I may respond, Ditto, in all good faith. I have endeavoured to show you from your own letters that it is not possible for us to give assistance when you fail to put before us, tersely and clearly, the points on which you stand in need of aid, and equally impossible for us to tell you how to do work with machinery that is incapable of turning out that which is required; and how to buy materials under market price, or how to achieve any end which involves manual labour without the expenditure of both time and trouble. Kindly understand that although I shall be always willing to give you a direct answer to a plain question, I have neither the time nor inclination to enter into interminable disquisitions on the points that you advance with such vagueness and want of reality, and to endeavour to follow you, as you shift your ground or advance some new element after each reply.

Rectification of Ordinary Tools.

H. W. (*Newton Abbot*) writes:—"I find that ordinary tools, generally, except, perhaps, from the very best makers, require overhauling and adjustment before being fit for use, and some of the new American appliances are so imperfect as to lead one to condemn what may, after proper fitting, turn out a really good thing. Who has ever found a plane that did not require the wedge to be altered either back, front, or at the sides, or the face truing, or the block generally squaring, or the gap rectifying, or the iron squaring, and whoever found the iron of a plane, or of any chisel, with the side that ought so to be, *flat*. In some respects, second-hand tools, if not too old, are better than new, because those things have been attended to; but buyers should be cautioned that many 'waster' new tools are sold as second-hand, which might just as well be thrown on the fire at once."

Brass Casting.

T. H. W. (*Rhyl*).—Yo will find all the requisite information on this subject in Vol. II. of Amateur Work (in Parts 14, 16, 20, and 23). For furnaces apply to Mr. Thomas Fletcher, *Warrington, Lancashire;* but you can melt small quantities over an ordinary kitchen fire. Moulds for small castings may be made of plaster of Paris.

Clock-Making.

Casenhem says:—"I also agree with Anton that a paper on 'How to Make One of the Best Timekeepers' would be very acceptable, especially so if a good firm would supply the parts in the rough. Mr. Editor, why not throw out this hint to Messrs. Gillett and Bland's, *Croydon?*" [I "throw out" the hint to Messrs. Gillett and Bland, and leave it to them to act on your suggestion, if they are willing to do so. A series of papers on Clock-Repairing is in preparation, but these would in no way interfere with a paper showing amateurs how the parts of a clock, to be obtained from any particular firm, are to be put together.—Ed.]

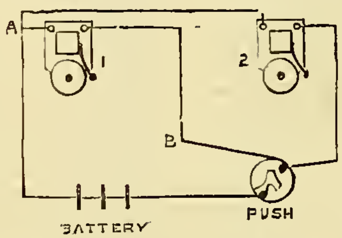
Amateur Chuck for Lathe.

H. W. (*Newton Abbot*) writes:—"I have noticed in many late numbers of Amateur Work remarks that the majority of American chucks were not true, and the writer of the articles on 'Lathe-Building' seems to endorse this statement. Is it not possible that some fault may be due to the wrong setting? This would tell against any chuck—American or English—self-centring or otherwise, and, of course, most against the self-centring, with which a correct beginning is most necessary. A self-centring chuck which does not centre is worse than useless. My experience has reference only to the 'Amateur Chuck,' with two sets of jaws—one for inside and one for outside work—taking up to 2½ inches, and costing 32s. or 34s. I do not describe it further, because I presume it is well known to your readers, and it has been depicted and described in 'Every Man His Own Mechanic,' page 272, and in Amateur Work, and also well advertised. I have had one for four years, and find it the most valuable adjunct possible to the lathe for all ordinary light amateur work, and it remains perfectly true. I fixed it on a face-plate turned up true *on my own mandrel*, and I made a hole through the centre of this face-plate corresponding with the hole in the 'chuck,' which enables me to use it for square-shanked, as well as round, drills, in the same way as the Miller's Falls Drill-Stock takes the Morse Drills, clasping them in the round part, the square passing through. It takes even ordinary and Jenning's and Gilpin Screw Auger-bits with sufficient accuracy of centring to make them available; and the two latter are often especially useful for boring *deep* holes, as for needle-cases and numerous such purposes. In making wood chucks, except for uses of a permanent character, I find it unnecessary to be at the trouble of boring and fixing them on the mandrel. I simply turn up the wood true, and then grasp it in one or other of the jaws of the chuck, and turn it to any size or shape I require; and I can always adjust it again at another time when necessary. If I require a larger cup chuck than the 'Amateur' allows, I make it in this way, with a recess or shoulder on the butt end, as one may call it, to fit the jaws. If I want a small chuck—say a ring-chuck, or to slip in any bit of wood to turn up either with a back centre or not, I often find the drill facets of this chuck available where a prong-chuck could not be used, and even where it can, this mode is frequently much more simple and handy. Another purpose I apply it to is for the circular-saw, brushes, buffers, circular hone (an expensive but very enjoyable luxury), and other things carried on a spindle fixed in the drill-jaws, instead of in the clumsy and unsatisfactory carrier-chuck. I must mention, however, that care must be taken to turn up the spindle-shank true, this not being always attended to when it is intended for a carrier-chuck. Perhaps some of my brother amateurs may work out my hints, and they will find many very varied purposes for which this chuck is available; and I venture to say that, though the first cost may seem rather great, when it is considered to how many uses it may be turned, and how many other chucks and appliances it supersedes, it is worth any money. What, in practice, may be considered a good test is that it is the chuck of all others most constantly on the mandrel-nose."

Illustrations Omitted.

The accompanying illustrations to replies on "Electric Bells" and "Telephone Transmitter," both in page 254, were ac-

Electric Bells. Dawlish.



CONNECTION OF ELECTRIC BELLS.

Telephone Transmitter. S.W.O.(*Croydon*).

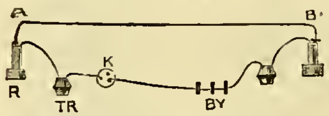


DIAGRAM ILLUSTRATING CIRCUIT OF TRANSMISSION.

cidentally omitted, and are now supplied, in order to make the instructions given to Dawlish and S. W. O. (*Croydon*), perfectly intelligible.

Chest-Expanding Braces.

W. H. E.—The measurements were given by one who had made several pairs for himself and friends, and had experienced benefit from them. It is reasonable to suppose that a broad-backed man would require a longer back-strap, and this should be allowed for before making up the braces. Some discomfort is likely to be experienced at first on account of the straps pulling the shoulders back, as they are intended.—G. E.

Shifting Handles for Bits, etc.

H. W. (*Newton Abbot*) writes:—"I have adapted two handles, which I find of immense advantage—one is in shape somewhat like a gimlet handle, but more substantial, and almost 4½ inches long; and the other a straight handle, say such as would be made for a large file or chisel, 6 inches long, and also substantial. Both are of hard wood. They have square taper holes cut—one in the side and the other in the end—and as this last is lengthway of the grain, it is fitted with bits of zinc driven in to prevent splitting. They are to take drill bits, etc. I will give you an instance how useful I found the straight one the other day. I wanted to pass a wire to an upper room, close to the wall, where it was impossible to use a brace or even a ratchet, but, with a 'Gilpin' bit fixed, I found no difficulty in drilling through the whole depth of the joist, which happened to come just where I wanted my hole." [Would you not have found the long gimlet (or "nail-passer," as Devonshire carpenters used to call the gimlet years ago, and perhaps to this day) used by bell-hangers for this very purpose? You describe a more convenient tool because more yielding than your stiffer appliance. Still, your plan is a good one, and worthy of adoption by all amateurs, and professionals, too.—Ed.]

INFORMATION SUPPLIED.

A Query for Turners.

H. E. B. (*King's Lynn*) writes in reply to Enquirer:—"If I remember aright, Mr. Northcott in his work on the lathe describes a method of executing *oblique* or *inclined* turning, such as Enquirer seeks for, by means of what he calls, I think, a pumping mandrel. I have not the book by me, so am without means of verifying my recollection; but so far as I can remember the description, which, I am sure, I have somewhere read, the pumping mandrel is a traversing mandrel fitted with a stud which works in a groove cut obliquely in a guide or supplementary bearing, embracing the mandrel. This gives to the mandrel a reciprocating endlong movement during its revolution. The same effect might be produced in another and simpler way. Presupposing the possession of a headstock with traversing mandrel, mount a sufficiently strong spiral spring on that portion of the mandrel between the face plate of the pulley and the front bearing of the headstock. Make a pattern for a flange chuck, or cup chuck, with a deep ring projecting like a crown on the back of it, cut a slice off the ring, obliquely, at the required angle, get a casting from this pattern, turn it up, and fit it in the usual way to the mandrel nose, true up the circumferences when mounted, file carefully the oblique edge of the ring till it is clean and true. Next, prepare a strong stud to be screwed into the face of the headstock below the bearing, provide it with a hardened steel roller, strongly pivoted, for the edge of the crown ring to run against (the circumference of the roller should be slightly convex). Of course, the diameter of the ring must be previously calculated, to ensure the centre of its edge impinging on the centre of the roller; in action, continuity of contact will be kept up by the elasticity of the spring on the mandrel. The idea of this has just occurred to me, possibly it is not new, I have never seen it, however, or tried it, but I see no reason why, with careful construction, it should not answer the purpose. Still, even with a pumping mandrel, the exact outline

given in section by ENQUIRER could not be arrived at, inasmuch as the curves on either side of the axis are not alike, and with a pumping mandrel and fixed tool they would be counterparts of one another. Had I to do any work of the character portrayed, I should do it in two pieces—(1) turn up the stem plain to outline required, then cut off the end obliquely to angle required. (2) Turn an elliptical plate for the top, with the ellipse chuck, leave a short central pin or stud on the under side, plain turned mount by this in plain chuck to finish off top surface. (3) Drill shallow hole size of pin in centre of oblique end of stem, mount finished plate on this, using, if hard wood, coaguline or some similar cement; if soft wood, good hot glue. The upper projection of knob, with edges of inner and outer bevel, as shown, could not be got like this, nor the diverse curves of the overhanging lip. If the former were a *sine qua non*, I should get at it by making it a third piece, to be turned and cut off from a cylinder by help of the pumping mandrel, and cemented into its place."

H. R. (*Leeds*) writes:—"Your correspondent ENQUIRER will find the information he desires on Oblique Turning at page 291 of H. Northcott's book on 'Lathes and Turning,' where an illustration is given of this work."

Cleaning Varnish Brush.

EDWARDUS writes in answer to AJAL:—"I have seen the following recommended: Soak the brush twenty-four hours in raw linseed oil, and rinse it out with hot turpentine, do this till quite clean. I always clean mine with *strong* hot soda and water."

Varnish for Violins.

L. T. (*Abergavenny*) writes in answer to S. F. C. (*Liverpool*):—"If he wishes a reliable oil varnish I find that made by Geo. Withers, *St. Martin's Lane*, very useful. It is of a deep amber hue, and soon drying. It is, in my opinion, too thick for use, and must be thinned by ozonised turpentine, and filtered, for like many varnishes containing copal, the copal is apt to form little clots. The translucency of the above is much increased by adding some dammar. As for spirit varnish, I mix equal parts of tincture of benzoin co., and that form of French polish which contains mastic, which was given in the articles on 'French Polishing.' This gives a tender, but plastic varnish of superb transparency. A fine silk pad must, however, be used. Such a varnish, however flexible, does not nourish the wood so well as an oil one, and therefore, I have fused mastic dammar and black resin, then dried and powdered it, and solved in turpentine. This is a good base. I shall be happy to answer, privately, any letters to me on the subject." [Letters to be forwarded must be stamped and marked L. T. (*Abergavenny*), in lower left hand corner.—ED.]

Copper Boilers for Models.

F. W. (*St. Augustine, Florida*) writes in reply to S. M. L. (*Goderich, Canada*):—"'The Young Mechanic,' mentioned above, will give the information asked for on the subject of Copper Boilers for Models."

OLLA PODRIDA writes in reply to S. M. L. (*Goderich, Canada*):—"Fig. 1 is a section through a horizontal boiler, and Fig. 2, the same. Corrugated plate over fire may be

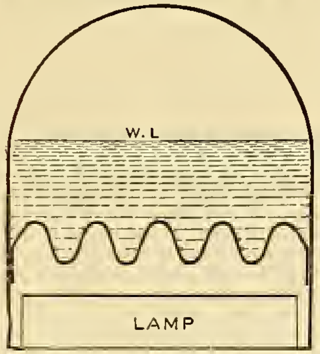


FIG. 1. HORIZONTAL BOILER IN SECTION.

shaped between wooden moulds. These types will be found to work very well. If the boiler is comparatively large in dia-

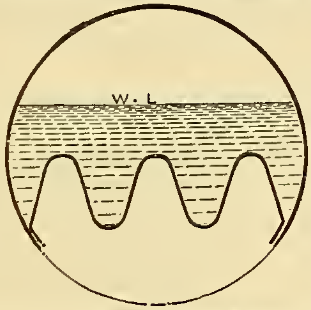


FIG. 2.—ANOTHER FORM OF HORIZONTAL BOILER IN SECTION.

meter, stay bridges should be fitted inside, across the corrugations, and attached by rivets to the centre one. Fig. 3 is a vertical

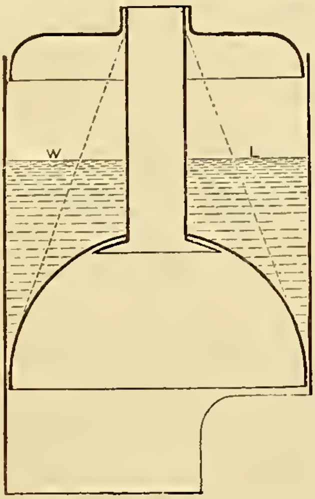
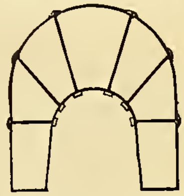


FIG. 3.—VERTICAL BOILER IN SECTION.

boiler of easy construction. The hemispherical fire box crown may be fashioned in a wooden mould, or the internal arrangement may be as shown ticked. Fig. 3 does not steam so well as the others, at least with a spirit lamp, it is better suited for charcoal. Never trust to solder alone, always insert at least a few rivets at intervals. I used to rivet my model boilers close, adding a good wash of solder to ensure against leakage. The joints may also be neatly brazed with the assistance of the blow pipe."

A. F. S. (*Dresden*) writes, in reply to S. M. L. (*Goderich, Canada*):—"Regarding your query about copper boilers, you do not say what you mean by engines of 1½ inch to 3 inches. Do you refer to diameter or stroke? The best-shaped boiler for spirit or petroleum burning is the saddle-shaped (as per sketch). These boilers require to

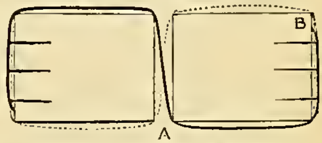


MID-SECTION OF VERTICAL BOILER.

be well stayed, as shown, when large, say 8 inches high. Solder is good enough for boilers up to 8 inches diameter, if you make a close joint with screws or rivets first. But why solder at all? If you use petroleum, have large burners, wicks 4 inches wide, set across bottom of boiler about 3 inches apart. I find, usually, vertical boilers give trouble with fluid fuel, and make a smell."

Cheap Hinges for Screens.

SIGMA writes:—"I will endeavour to explain to VETO the way I made my screen without hinges. I procured some webbing at an upholsterer's, enough to put two pieces at each end of each joint of the



WEBBING HINGE FOR SCREEN.

screen. I have endeavoured above to show a section of two parts of screen, the joint being at A, the webbing must only be nailed on the edges I have marked, and must be drawn as tightly as possible. I have left the joint open to show the course of the webbing, the second piece must be nailed immediately under the first, so that the edges touch where they are nailed, and also in the joint, but the second piece must be wrapped round in a contrary direction to the first, bringing it round the angle B, as shown by the dotted line. Serve each end of each joint in this manner, and it will be found very much superior to common iron hinges for the purpose."

Amber for Varnish.

CASENHEM replies to W. B. (*Gainsborough*), page 206:—"Amber is generally dissolved for varnish by mixing it, powdered, with linseed oil, and simmering over a fire that is kept up well. It could be obtained from any pipe-makers, but they do not care about parting with the powder, as they make up an artificial amber with it."

Double Fret Saw.

S. W. (*Liverpool*), writes in answer to Iago Cybi:—"The 'Double Fret Saw,' or as it is called, the 'Demon Fret Saw,' can be had at Mr. G. Busschots', 33, *Park Lane, Liverpool.* I believe that he is the only dealer in England that has got them, the price of them are 6d. per dozen, or 5s. per gross. They are very good for a pattern larger than your bow, and for any piece that has many points or corners, for instance, leaves or flowers, which you can cut without turning the wood round. They break very easily, but the advantage of them is, you have no need to turn, but cut back, as the general run of saws break in turning."

L. M. (*Condé, France*) writes in reply to Iago Cybi:—"If you cannot find any double fret saws in London, you will be able to get them at Lenelle's, 3, *Rue de la Fidélité, Paris.* The cost of the saws (*scies à double denture*) is 0.70 cents (about 7d.) per dozen, or 7 francs 50 centimes per gross. Lenelle would certainly send them by post in return for a Post Office Order including a few pence for postage. You would get them within a few days. I can recommend the firm."

Ink Stains.

J. G. (*Worksop*) writes in reply to F. A. E. (*Newtown Butler*):—"You should have used oxalic acid. Next time you try to remove ink stains, first dip the linen in boiling water, and at once sprinkle upon the stain a small quantity of salts of lemon (which you may get from any chemist for one penny), and in a few minutes the stain will disappear."

M. W. (*Burnley*) replying to F. A. E. (*Newtown Butler*) says:—That either oxalic acid or salts of lemon will take out the ink stains quickly, only the article must be washed in water to remove the salt, otherwise it will damage fabric.

G. W. W. writes in reply to F. A. E. (*Newtown Butler*) who asks how to remove ink stains from linen:—"Take one tablespoonful of chloride of lime, two quarts of boiling water, dip the stained linen in while hot, this will turn the stain yellow (called iron mould). This yellow stain I remove by spirits of salts, which I buy at the chemist's. Pour on very carefully just enough to wet the stain, it will steam and turn green instantly, it must then be dipped into boiling water. I drop the piece of linen into a copper, then take it out and look if the stain is gone, if not, touch it with the salts again.

INFORMATION SOUGHT.

Prize Demas Fret Machine Lathe.

A. W. W (*Gateshead-on-Tyne*) asks:—Has any one had any experience in turning with the Prize Demas? if so, would they tell me whether it is worth anything to an amateur, or can they recommend a cheap fret-sawing machine and lathe combined?

Japanese Stencils.

T. G. B. (*Liverpool*) wishes to know where Japanese stencils are to be obtained, such as are referred to in the article on "Corner Escritoire or Bureau," by Mr. J. W. Gleeson-White, in the March Number of Amateur Work, Part 40, page 215.

Back and Belly for Violoncello.

S. M. L. (*Goderich, Canada*) asks:—Will some amateur Luthier furnish me with proper thicknesses of back and belly for medium-sized "Cello." I would like a diagram showing as far as possible where the various thicknesses merge into one another, something after the plan given by Mr. Allen in papers on "Violin Making."

Imitation of Black Marble.

Data Quæsita writes:—"I want a composition to imitate black marble similar to that which is used for the French timepieces. I have tried various kinds of material, and each experiment has proved a complete failure. I thought that the composition used for buttons and imitation jet would be suitable; could anyone oblige me with the recipe for this?"

Medicine Cabinet.

Noel wishes to be told of a good medicine cabinet, or to be furnished with a design for one. [It would be useful to many at home and abroad if any surgeon or chemist among the readers of Amateur Work would supply such a design, and give a summary of the most useful medicines and appliances with which to stock it.—Ed.]

Division of Opera-Glasses.

Loco (*Sohagpur*) writes:—"Will any correspondent tell me how to clean, and also how to divide the large glasses of an opera-glass? The form of dullness between the two glasses has the appearance of ferns springing from the sides, as in Fig. 1. A section of the two glasses is shown in Fig. 2. Some two or three years ago mention of this defect in opera-glasses was made in the 'Scientific American,' and it was attributed to the balsam of commerce which had to be used for fixing the glasses."

FIG 1

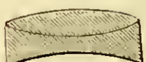


FIG 2

FIG. 1.—FERN-LIKE APPEARANCE OF DULLNESS IN OPERA-GLASSES. FIG. 2.—SECTION OF CONJOINED GLASSES.

Magic Lanterns.

L. S. D. (*Jamaica*) writes:—"Will any of your readers advise me in the purchase of a pair of magic lanterns for dissolving views, the size, and price I ought to pay for them, the diameter of the lens, and best place to procure them? What I want is a good pair of lanterns (but not *too* expensive) for evening parties and schoolroom lectures. Are the Magic lanterns or Phantasmagoria lanterns the best for the purpose, and is the new treble mineral oil lamp I see advertised sufficient, or will it be necessary to get the oxy-calcium spirit lamps for good effect? I shall be further obliged if you will inform me how the shadow figures which used to be exhibited at the Polytechnic in London are worked, and how the effect of the apparent disappearance into the ceiling is obtained. I believe it is by jumping over the lantern behind the screen, but shall be glad to receive full particulars and directions."

Waxing Meerschaum Pipes.

Juno (*Surbiton*) writes:—"I shall be obliged if any reader can give me any information on the process of waxing meerschaum pipes."

Wire Working.

A. W. W. (*Gateshead-on-Tyne*) asks:—Can any one tell me of a book on Wire Working? as I am greatly in want of one?

Spirit Lamp Brazing Apparatus.

A Young Amateur writes:—"In page 495, Vol. III. of Amateur Work, there is a design for a Spirit Lamp Brazing Apparatus. Could the ordinary paraffin oil or petroleum be used in the apparatus in any way? In looking over some old books I saw an account of a stove for cooking, that burnt petroleum gas, and it said that the gas gave out intense heat. If any of my fellow readers could give me a few hints on the use of petroleum for brazing, I should be very pleased."

Splicing Wire Ropes.

A. W. W. (*Gateshead-on-Tyne*) asks:—Can any reader give me instructions for splicing wire ropes, especially the four and six strand ropes, or tell me where I may get a book or something which will give me the instructions I require?

Hand Pump for Cellar.

Curious Chip Cutter writes:—"Can any reader help me out of a difficulty? I want to make a hand pump for lifting water from a badly-drained cellar; every time heavy rain comes on we are flooded. The cellar is a large one, and below the sewer; at the present time we have 2 feet of water. On one occasion we carried out 900 buckets of water. With 4 feet lift we could run it into drain pump; must be simple in construction, and not more than one or two men could work." [Are you not acquainted with the principle of construction of the common pump? It is to be found in any work on elementary physics, and a machinist, like yourself, ought to *be able* to adapt the principle to your requirements. Still, I leave the matter open for reply from those who may have found relief under similar difficulties. How much is the cellar below the *top* of the sewer? It seems to me that other means should be taken for *keeping the water* from entering the cellar at all, and not to call all hands to man the pump every time heavy rains fall. But without a plan and section of the basement of the house and its surroundings, it is difficult to suggest any mode of procedure for you. Write again, if you will, and clear up these points, and say *how* and from *where* the rain makes its way in.—Ed.]

Economical Electric Supply Association.

A. Y. S. writes:—"Will Twist Drill kindly let me know the address of the 'Economical Electric Supply Association,' and also the way to fit up the bell, which he says is easy." [The address wanted is *Wood Green, London, N.*—Ed.]

Hydraulic Motor.

A. Y. S. writes:—"Will Cato kindly say what size of lathe his hydraulic motor will drive, as I have two, one 3 inches, and the other, 5½ inches?"

Graph Composition.

STANMORE asks :—Can any reader give me a receipt for making a composition like those used in the "Hectograph" or "Compolithograph," for taking off any number of copies from one, which is written with a special ink. I have an old "Hectograph" tin which I wish to refill. [See remarks on this subject by J. G. (*Worksop*), and try the composition that he has used to his satisfaction.—ED.]

Red Beech for Plane Making.

SIGMA wishes for the address of any firm in London who can supply the red beech that is used for plane-making. [I give publicity to SIGMA's requirement, but in case it should meet with no response, I recommend him to write to Mr. T. J. Syer, 1, *Finsbury Street, Chiswell Street, London, E.C.*, who can tell him anything he wishes to know about any kind of wood used in carpentry, joinery, cabinetmaking, and toolmaking, and who, if I am not much mistaken, can supply him with what he requires.—ED.]

Stencil Staining on Deal.

ROSELEA writes :—"Can any of our clever correspondents give me a few hints about applying stencil staining to common deal? I have erected a bathroom, which I mean to line with wood, and then varnish said lining. I purpose making a dado by staining so much with one of Stephens' stains. Between this dado and the unstained upper portion I would like one or two lines and some stencilled ornament, both to be done in darker stain. How can I keep this stain from spreading at the edges of stencil? Any hints as to staining and varnishing, will, I am sure, be welcomed by others as well as myself.

Tennis Bats and Badminton Bats.

T. B. B. wants to know how tennis bats and badminton bats are made. [I fear a short paragraph would be utterly insufficient to explain the *modus operandi*. As you have succeeded in making a tennis bat, which "seems to be right," why do you not persevere with the work until you are sure that your work is right, and then write on it for the benefit of your brother amateurs? The system on which bats are strung, is, I should imagine, to be discovered by a careful examination of a new bat, or by taking an old one to pieces.—ED.]

Re-Tinning Stewpans, etc.

J. C. writes :—"Will any one kindly give me instructions as to re-tinning copper stewpans or plain moulds? I have seen it done some years ago, but was not sufficiently observant at the time to profit by it, although it seemed a very simple matter."

Renovation of Leather Work.

J. F. L. (*Deptford*) writes :—"I have a leather frame, which was varnished some years since with white hard spirit varnish; it has now come to look shabby and limp. Can you tell me the best means to clean it, and to stiffen the leaves and flowers again?"

Polishing Oyster Shells.

ASH PRIORS wishes to know how to polish some large oyster shells from the Persian Gulf. The backs are encrusted with small shells, which it is wished to clean off, with several layers of the coarse outer shell. The inside is hard and polished mother-of-pearl, except in the centre, where the oyster has been.

Trap for Sparrows.

K. A. T. wishes to know how to make a trap for sparrows. It is desired to take the birds alive, so that the sparrows may be killed, but any other birds taken with them may be liberated. [Poor sparrows!—ED.]

Hot Water Bath.

ABVONIA writes :—"A house I have just taken to has a room just suited for a bathroom; and I would be pleased with any instructions for making up a cheap serviceable bath to heat with gas. I have a good shop to work in, and time to spare, but should want to know the name of tinmen's tools, and where I can procure them cheap, I should want o use in making it. I consider myself h ndy enough in the use of a soldering iron, as I often use it, and believe, with a little instruction and working drawings, through the medium of our excellent AMATEUR WORK, to accomplish the above.'

Wire Gong for Clock.

F. H. R. writes :—"I should be much obliged if any of my fellow-subscribers could enlighten me on the mode of making and fixing a wire gong in a clock. I heard one a little time ago, which had a magnificent tone, like 'Big Ben,' and which appeared to be simply a double circle of wire. I tried to make one of steel wire, but could get nothing like the depth and purity of tone I want. I have asked the price of them in Clerkenwell, and find they cost 10s. to 12s. Is there any reason why they should cost this apparently high figure?" [These wire gongs are used in American striking clocks that are driven by weights. I have one in a clock that cost me, as far as I remember, a guinea, and if the gongs were as dear as those in Clerkenwell, they would not be found in clocks sold at so low a figure. Their form is that of a flat coil, or rather a coil of wire in one and the same plane, with a straight piece in the centre, which is fixed in the projecting hub of a circular boss of metal that is screwed to the interior of the case. The coil and outer end is free, and when struck by the hammer, the wire vibrates throughout its length, and thus emits its full deep sound.—ED.]

REPLIES DEVOID OF GENERAL INTEREST.

W. W. E. (*Wath-on-Dearne*).—The subject you mention cannot be treated conveniently in the series of papers now in hand on "Scene-painting." It may be treated in a separate article or two at some future time.

E. JOHNSTON.—Your paper is declined with thanks. A table made according to your front elevation would be in every body's way, and be always coming to grief, as, according to the scale, the bottom of each leg projects at least three inches beyond a perpendicular dropped from the edge of the table. You do not append your address, so I am unable to return your article. If you wish to have it, kindly send me an envelope, stamped and addressed.

SALE, PURCHASE, OR EXCHANGE.

Persons availing themselves of this Department of AMATEUR WORK *are requested to note that—*

(1) *No Trade Advertisements can be inserted in this Department, which is open to bonâ fide Amateurs only. The Editor reserves the right of refusing to insert any notice.*

(2) *No charge will be made for the insertion of notices until their number be such as to render it absolutely necessary to do so.*

(3) *Persons writing in reply must forward application under cover to the Editor, in an envelope sealed down, with a Penny Stamp attached in the upper right hand corner, and the* NUMBER *of the notice in the lower left hand corner thus :—*

	STAMP here.
NO. OF NOTICE here.	

(4) *Letters thus marked and enclosed under cover to the Editor will be forwarded immediately to owners of articles for Sale or Exchange, or persons wishing to purchase. No attention will be paid to any communications in which these Rules are not strictly observed.*

(5) *It is desirable that those who reply to notices in this Department should enclose to the advertiser, with their application, a stamped and directed envelope, in order to ensure a reply. When this precaution is not taken, the non-receipt of a reply within reasonable time can only intimate that the article in question is disposed of, or that the proposal made is declined.*

348. One-Manual Pipe Organ.—Six Stops, throughout, G G to E, 58 notes, 364 pipes, all metal, except one stop of wood; two octaves of pedals to pull down keys; enclosed in general swell. In thorough repair. Cash price, £15, or will exchange in part or whole for American Organ or Harmonium. (*Wimborne.*)

349. Square Grand Piano.—Handsome instrument, by Broadwood, in mahogany case; newly restrung and repaired. In good condition. A bargain, £7. (*Wimborne.*)

350. New Carpet Felt, for laying under carpets, about 11 yards (59 inches wide), price 2s. 9d.; cost nearly double; purchaser to pay carriage. (*York.*)

351. "Amateur Work."—Three Vols., half calf, and extra parts, complete. What offers? Old coins wanted. (*Halesworth.*)

352. Violin, with Bow, in case, complete. New last Christmas. Price 16s. (*Peckham, S.E.*)

353. "Amateur Work."—Vols. I., II., III., wanted. Must be clean, with all plates, and cheap. (*E. Dulwich, S.E.*)

354. "English History, from Invasion of Julius Cæsar to Dissolution of Parliament, 1774," at which date it was published by Johnson and Goldsmith, London. In 14 small volumes, with plates, and now in excellent condition. For cash, £1. (*Banbury.*)

355. Electrical.—Large Frictional Electrical Machine (cylinder, length 11 inches, diameter 8 inches), Conductor, Rubber, etc., well insulated, and mounted on mahogany baseboard. Suitable for Science Class or Home Experiments. 25s., or what offers in exchange? (*Banbury.*)

356. Achromatic Telescope, 30 inch, day or night, eight draw, by Abrahams & Son, *Liverpool*, in strong leather case. Fine definition, very compact, and in good order. Cost, when new, 50s., will sell for 25s., and pay carriage to any address. (*Ambergate.*)

357. Electrum Drawing Instruments.—Good case of, wanted. State lowest cash price. (*Ambergate.*)

358. "Universal Instructor."—Wanted, Vol. III., bound. Must be clean and cheap. (*Huddersfield.*)

359. Lever Printing Press.—Prints 6¾ by 4½ in. Price 8s. 6d., carriage paid. (*Bedale.*)

360. Indiarubber Stamp Making Apparatus, complete. Price 7s. 6d., carriage paid. (*Bedale.*)

361. Washing, Wringing, and Mangling Machine, Vowel E, made by Bradford, of *Manchester*. Length of rollers, 2 ft. 3 in. Been very little used. What offers? (*Manchester.*)

362. "Amateur Work."—Vols. I., II., III. wanted. Must be clean for binding. State lowest price. (*Manchester.*)

363. "Engineering."—Weekly Nos., July to December, 1880; all in good condition. Cost 14s., will take 8s. (*Clapham.*)

364. "Every Man His Own Mechanic."—Nos. 1 to 6 inclusive, and No. 8. Will exchange for Spon's "Workshop Receipts," or Tools.

365. Books on Oriental Languages.—(1) Wilson's Sanskrit Grammar, 5s.; (2) Wilberforce's Clarke's Persian Manual, 3s.; (3) Redhouse's English-Turkish and Turkish-English Dictionary, 2s. 6d. Purchasers to pay carriage. (*Bristol.*)

366. Brass Slide-Valve Cylinder, rather out of repair, 2 in. bore, 3 in. stroke, together with eccentric crank, cast-iron flywheel, piston rod, axle, etc. Weight of the above, nearly 6 lbs. Price 7s. 6d., or offers. Buyer to pay carriage. (*Sheffield.*)

367. "Amateur Work."—Vol. I. wanted, cheap. (*Sheffield.*)

368. Lathe Wanted, Treadle, 4½ or 5 in. Centre, with 3 ft. 6 in. or 4 ft. Bed. Preference will be given to one with Back Gear and Gap Bed and Slide-rest. Must be in good order. State maker's name, lowest price, and full particulars. (*Oldham.*)

369. "Amateur Work."—Wanted, either of first three Vols., in parts or bound. (*M. F. Dobson.*)

370. Harmonium Reeds.—Several sets of good new Harmonium Reeds, by best maker, 4, 8, and 16 feet tone, cheap, for cash. (*London, E.C.*)

371. Portrait Lens.—Quarter Plate, good. Price 12s. (*London, E.C.*)

372. Books, Various.—(1) Dicks' "English Library," 3 vols.; (2) "Youth," Vol. 1. Will exchange for small Fount of Type. (*Plaistow.*)

373. Fret-Sawing Machine, with Lathe Attachment and Circular Saw, Tools, etc., complete. What offers? (*Plaistow.*)

374. Revolver, first-class, large bore, capital weapon for house protection. Will sell for 10s.; or what offers in tools or otherwise? (*Chelsea, S.W.*)

375. Music for Organ Wanted, either new or secondhand, cheap. (*Stockton-on-Tees.*)

376. New Gem Camera and Lens.—Takes 12 photos. on ¼ plate. £2 5s. (*Wath-on-Dearne.*)

377. Bicycle.—"Special Express," 50 in., ball both wheels. £4. (*Wath-on-Dearne.*)

378. Banjo, with resonant case to improve the tone. 12s. 6d. (*Wath-on-Dearne.*)

379. Castings for Hand Dynamo, complete, with cotton and silk covered wire. £1 5s. (*Wath-on-Dearne.*)

380. Violin with Bow. 12s. 6d. (*Wath-on-Dearne.*)

381. Fret Machine. 12s. (*Wath-on-Dearne.*)

382. Gas Pillars.—Suitable for counters, etc What offers? (*Wath-on-Dearne.*)

383. Books, Various.—(1) Cassell's "Illustrated British Ballads." Quite new. Complete in 24 7d. parts, 7s.; (2) Cassell's "Illustrated Universal History." 41 7d. parts of the above, quite new, 13s. (3) Chambers's "Information for the People." 2 vols., complete, bound, 4s. (*London, N.*)

384. Chemical Cabinet, good, in mahogany, with lot of chemicals. Price £2 2s. List of chemicals and photo. post free. (*London, N.*)

385. Music, etc., Various.—(1) Callcott's "Grammar of Music," 1s. 6d. (2) Pitman's "Sacred Songs and Duets," 2s. (3) "Evergreen," 9d. (4) "Brightest and Best," 1s. (5) "Sacred Melodist," for years, 2s. (6) "Design and Work," 50 numbers, 2s. (*Buckingham.*)

386. Violin, in good condition, 14s., or will exchange for Organ Music, or Cornet with little cash, or other instruments, etc. (*Buckingham.*)

387. "English Mechanic." — Several volumes, unbound. Will exchange for any thing useful, or dispose of them almost at value of waste paper to get rid of them. (*Bristol.*)

388. Bicycle.—54 inch, close built, semi-racer, by J. Keen, suitable for road or track, warranted sound and in beautiful order. Brass hubs, 96 spokes in front wheel, nearly new tyres, horn handles, pouch, lamp, saddle, and bell complete. Price £5 5s.

389. Tricycle, two 50-inch wheels; requires repairing. Will exchange for organ work in good condition.

390. Works on Elocution.—"The Art of Extempore Speaking," and "Hints for the Pulpit, the Senate, and the Bar," by M. Bautain, Professor at the Sorbonne. Both new and clean. Offered for 2s.

391. Model Horizontal Steam Engine and Boiler. — Well finished, all brass, safety valve, gauge tap, etc., cylinder, ⅝ in. bore, 1½ in. stroke. Will take 18s., or exchange for AMATEUR WORK, first 3 vols., and castings of 2½ in. centre Lathe Mandrel Head, back geared. Buyer pay carriage. (*London, N.W.*)

392. Cassell's "Popular Educator."—New and Revised Edition. Well bound and clean. What offers? (*Oldham.*)

393. Ebony Piccolo.—Six-keyed, in D, with extra flageolet head, by Butler. Sweet tone, nearly as good as new. Cost 24s. Price 10s. (*Hertford.*)

394. Vocal Music.—Songs for sale, baritone, contralto, comic, etc., by the following eminent Composers, Pinsuti, Molloy, Smart, Wellings, Cowen, Hutchison, etc. Long list sent on application. (*Graigue, Ireland.*)

395. Type.—32 lbs., four varieties, in two cases. Will exchange for Lathe, or good Anglo-German Concertina, or offers. (*Croydon.*)

396. "Every Man His Own Mechanic." Re-issue just complete, 13 Parts, in good condition and quite clean. Will take 5s., buyer to pay carriage. (*Clonakilty*).

397. Cassell's "Illustrated Shakespeare," large size, Parts 1 to 43, not soiled. Will exchange for AMATEUR WORK, Vols. I., II., III., unbound, with the folding sheets. (*Folkestone.*)

398. Oil Colours. etc.—Wanted, Box of Oil Colours and Materials in good condition. Full particulars and lowest price to be sent. (*Cove, N.B.*)

399. Books for Sale.—(1) Ventriloquism (Maccabe's), 7½d.; (2) Stokes on Memory, 7½d.; (3) Shorthand, Various; (4) Civil Service Guide to Employment, 11d.; (5) Amateur Authors, 5d.; (6) Amateur Stage, 5d.; (7) Lewis' Topographical Dictionary of England, County Maps, etc., complete and perfect, four monster volumes, 10s. 6d.; (8) Smollett's History of England, complete, perfect, 15 vols., leather, 8s. 6d.; and other books. List on application. (*Folkestone.*)

400. Tools for Sale.—(1) Circular Saw Attachment, with Adjustable Table, etc., for 3 in. Centre Lathe, 20s.; (2) Best Wing Nut Brace, 24 Bits, 7s. 6d.; (3) Trying Plane, 5s.; (4) Screw Plate, cutting six sizes, 4s.; (5) large size Archimedean Drill, six Bits, 4s. All good as new. (*Newcastle, Staffordshire.*)

401. Books and Skates.—What offers in exchange for book on Fretwork and Turnery, 1s.; Smedley's Hydropathy, 2s. 6d.; Pair of Plimpton's Roller Skates; 1 vol. Design and Work, unbound; 1 vol. (38) English Mechanic, unbound. (*Exeter.*)

402. Fifty-inch Bicycle, with accessories, by Coventry Machinist Co., half bright, good strong machine, ball bearings. Price £4 to immediate purchaser. (*London, E.C.*)

403. Electrical Apparatus.—(1) Pair of Ader's Electrophones, 40s.; (2) Two Portable Army Batteries, as used in the Soudan, 10s. 6d.; (3) Quarter-inch Ruhmkorff Coil, with Commutator, 10s. 6d.; (4) a Six-room Indicator, 21s. (*Manchester.*)

404. Pedometer, nickel-plated, 10s. (*Manchester.*)

405. Experimental Physics, by Winhold, 10s. 6d. (*Manchester*).

406. Merveilleux Camera, with cash, offered in exchange for Instantograph Camera. (*Brixton, S.W.*)

407. Organ Pedals Wanted, Second-hand, Concave Radiating, 2½ octaves, in good condition. (*Old Charlton.*)

408. Organ Pedals for Sale, 1½ octaves, 15s., and Soundboard for same, £2; also a 4-stop Soundboard, amateur work, £2. (*Old Charlton.*)

409. Printing Press. — Wanted a small good Press, to print up to 8 by 6, about, with Type. State lowest price. (*London, N.*)

410. Photo Lenses.—Wanted (1) a No. 3 Dallmeyer's Wide Angle View Lens, 10 in. focus; (2) a Dallmeyer's Wide Angle Rectilinear, No. 1, 7 inch focus. State lowest price. (*London, N.*)

411. Telescope.—Wanted, a No. 4 Gregory's Telescope. State lowest price. (*London, N.*)

412. Jewellery.—(1) Solid Silver, Government Stamped, Albert, 10s. 6d.; (2) Silver Ring and Scarf Pin, 1s. 3d. each; (3) Gold Albert, 35s., and some other Jewellery. List on application. Worth double in every case. (*Birmingham.*)

413. Sewing Machine Stand, mahogany top, massive iron legs, heavy flywheel, fitted with iron arm and steel spindles for fretwork on "Challenge" principle, but not yet finished. Full particulars and sketch sent. Could be easily adapted to designs already given in AMATEUR WORK. Price 15s., or useful exchange. Wire netting and garden netting wanted. (*Kendal.*)

414. "Every Man His Own Mechanic," in exchange for "Amateur Mechanic's Workshop," or AMATEUR WORK, from the commencement. (*Buxton.*)

415. Stock and Dies Wanted, $\frac{1}{16}$ in. to ½ inch, cheap. Whitworth's thread. (*Buxton.*)

416. Violin. — Beautiful tone, fine bow, good lock-up case. Cost £4. Offered at 30s., carriage paid.

*** List closed March 4th.

COMMUNICATIONS AWAITING REPLY

E. B. (*Thirsk*); J. T. W.—No replies to your queries have been received from the gentlemen to whom they were forwarded, and who should have answered them. Please repeat.

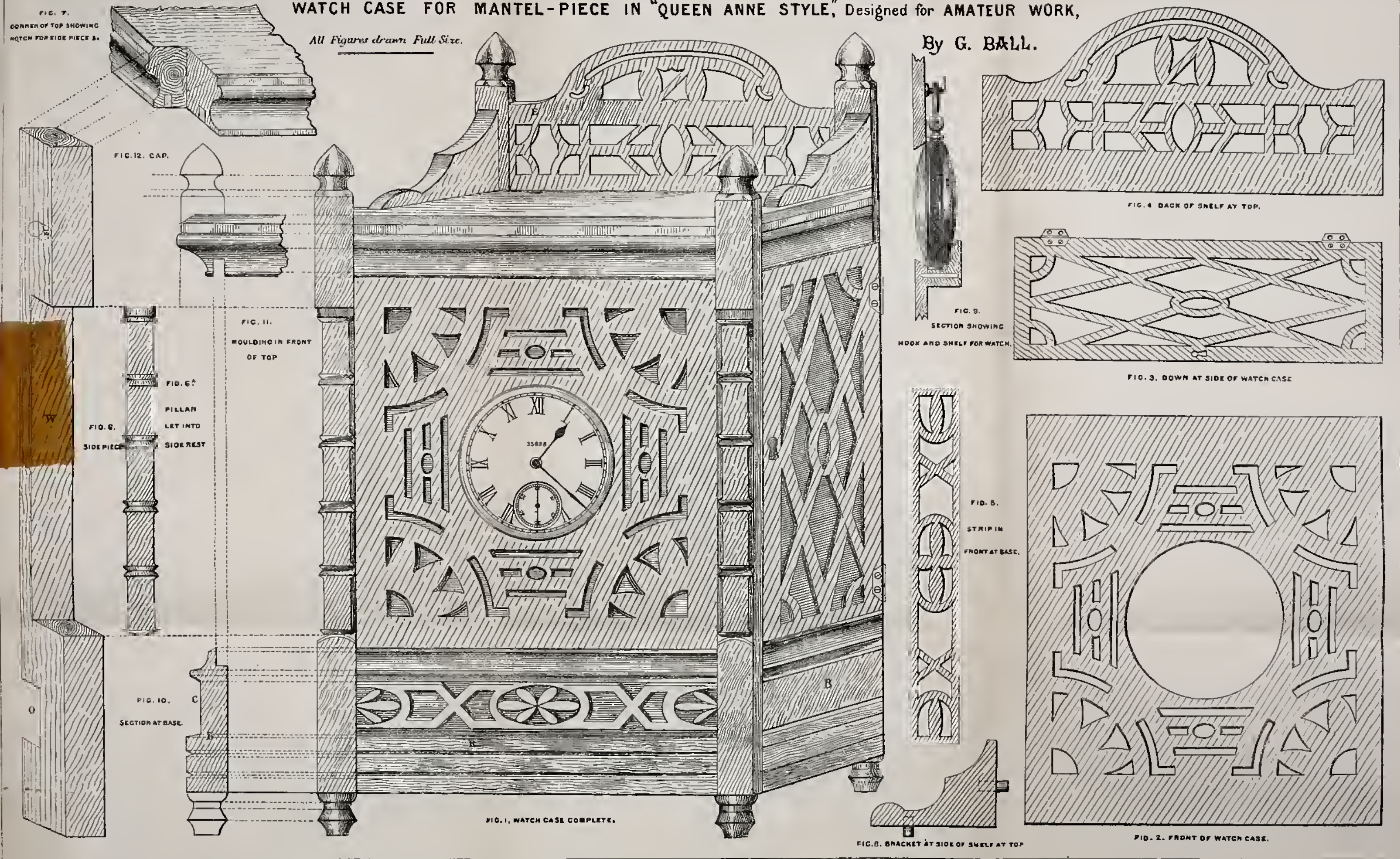
H. W. (*Newton Abbot*); F. W. (*St. Augustine, Florida*); LALANDE; M. W. (*Burnley*); AONIA; ROSFLEA; OLLA PODRIDA; E.C.C.; A. M. H. (*Edinburgh*); A. W. W. (*Gateshead-on-Tyne*); H. F. K.; SILIBILI; H. H. (*Canterbury*); B. (*Canterbury*); E. A. T.; JUNO (*Surbiton*); T. G. B. (*Liverpool*); G W. (*Buckingham*); A DISAPPOINTED ONE; L. M. (*Condé, France*); P. B. (*Devonport*); AJAX; Messrs. CHURCHILL & Co.; NOVS; D. B. A.; CASENHEM; G. C. C.; A. F. S. (*Dresden*); W. F. W. (*Birmingham*); FLUTE; WARDED BORSENUSCH (*Syra*).

List closed March 4th, 1885.

WATCH CASE FOR MANTEL-PIECE IN "QUEEN ANNE STYLE," Designed for AMATEUR WORK,

All Figures drawn Full Size.

By G. BALL.



A HOME-MADE LAWN TENNIS MARKER.

By OXONIENSIS.

HAVING been successful in my efforts to make the above-named article, and having from time to time received very useful hints from the subscribers to your magazine, it occurred to me that I could return their goodness by describing how I made my lawn tennis marker. I will state at the outset that mine cost me 3s. 6d., but I had some of the materials by me, which all may not have.

To start with, get a tin biscuit box, 9 inches long by about 4 inches broad and 4 inches deep. I give the size of mine, but of course it can be made larger according to the size of tin you can get. Then cut two pieces of deal, 1 inch thick and 18 inches long by $5\frac{1}{2}$ inches deep—these are for the sides; then two pieces $4\frac{1}{2}$ inches square for the ends, and a piece 9 inches by $4\frac{1}{2}$ inches for the bottom. Fasten these together, so that when the tin is inside it fits tightly everywhere. However, before putting the tin in and securing it there, cut a hole in the end level with the bottom, and about $\frac{1}{2}$ inch in diameter, and a corresponding one in the wooden end covering the tin, and into that fit an old beer or wine tap, which most people have by them, previously flattening the mouth, so that it should spread out. Then cut out a wheel 6 inches in diameter, and make an axle for this 1 inch in diameter: cover this wheel with cloth of some sort or else with flannel. Then cut two pieces of wood, $9\frac{1}{2}$ inches by $2\frac{1}{2}$ inches, and fix the wheel in them, cutting two holes for the axle to revolve in, and fasten them where shown in Fig. 2, at A. The axle should go through both supports nearly to the outside, but not quite, as the holes can then be covered with a neatly turned button. Previously to this, however, I cut out two circular pieces of $\frac{1}{16}$ inch iron with a diameter of $6\frac{1}{4}$ inches, and fitted these each side of the wooden wheel, so as to make a rim $\frac{1}{8}$ inch deep all round the wheel; this keeps the chalk from running to waste down the sides of the wheel. I then fitted on a handle and legs, and well puttied all cracks, and gave the marker two coats of chocolate paint, and it amply repaid the trouble I had taken. The only drawback was that one had to stoop down to turn the tap on and off, but this might be rectified by a strong spring made to keep the tap turned off, and a string brought round the outside and up the handle, running in wire loops, so that by pulling the string the tap was turned on, and the spring turned it off immediately the string was slackened.

The drawing will, I think, explain my meaning: it is drawn to a scale of $1\frac{1}{2}$ inch to the foot, or one-eighth full size. If any amateur is able to make the above from my instructions, I should be glad to know of it through the pages of the magazine, and I will give help to any one requiring it. I would add that the iron sides to wheel should be omitted if the machine is for a gravel court, as the iron would cut the gravel.

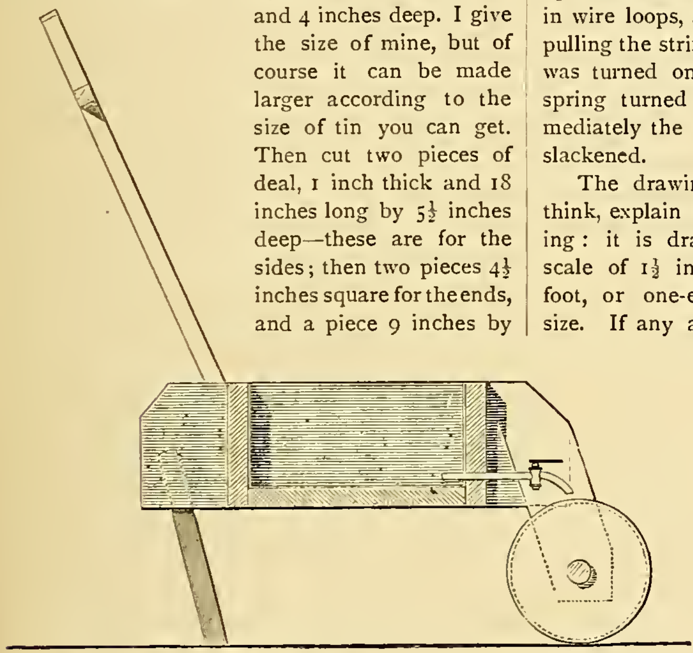


FIG. 1.—SIDE ELEVATION OF HOME-MADE LAWN TENNIS MARKER.—SCALE, $1\frac{1}{2}$ IN. TO 1 FT.

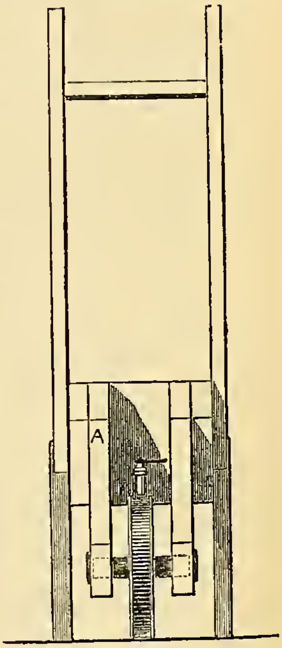


FIG. 2.—FRONT ELEVATION.

The contrast between the price of the home-made lawn tennis marker and those that are to be purchased of the ironmonger, is very great: the former costing, as I have said, 3s. 6d., and the latter at least four times as much. The home-made article may not be as handsome to look at as the other, but it is quite as serviceable, and marks out a court clearly and quickly, which is all that is expected of a machine of this kind. I am sure that those who make it will never regret the time and trifling amount expended on it.

THE PANSY, AND ALL ABOUT IT.

By GEORGE J. HENDERSON.

II.—LIST OF BEST KINDS—SHOW PANSIES—FANCY PANSIES—PREPARING FOR SHOW—SOCIETY'S RULES—REGULATIONS FOR EXHIBITORS.

LIST OF BEST KINDS.—When a beginner gets hold of a Pansy Catalogue he will perhaps be surprised at the large number of varieties offered for sale. He will also find some long glaring descriptions to some of them, or, as I heard a fancier remark, "With long handles at the end;" others will only have their colours mentioned. This makes any one unacquainted with them, imagine they are deficient in quality, but this is by no means the case. I have purchased some with long descriptions; they have turned out short of expectation, while others have grown high-class flowers. I here give a list of varieties, which are proved to be some of the best in cultivation. Should these not be enough, I shall be happy to give a longer list to any one who sends me a stamped, directed envelope. The Editor has my address.*

SHOW PANSIES.

Dark Selfs.—David Malcolm, Rev. J. Morrison, Crosshill Gem, Alexander Watt, Peter Lyle, Sir Francis Chantry, Mauve Queen, John Ormiston, Artemis, Captain Crombie, A. Fox, Sunny Park Rival.

Yellow Selfs.—Gomer, Tom Bates, William Crockart, George McMillan, Golden Circle, Lizzie Stewart, Zama, Jane Cuthbertson, Cherub, Miss Lizzie Haig Bowie (primrose).

White Selfs.—Mrs. Dobbie, Mrs. Cadzow, Mrs. Galloway, Mrs. Turnbull, Mrs. Adam, Mrs. Maccalman, Snowball, Silverlight.

White Grounds.—Miss Jessie Foot, Miss Barr, Miss Ritchie, Mrs. Miller, Jane Greive, Mrs. J. G. Paul, Miss Meikle, Miss Baird, Miss Fargie.

Yellow Grounds.—William Robin, Bailie Cochrane, David Dalgleish, Mr. A. Irvine, Lizzie Bullock, Robert Burns, Robert Pollock, Corsair, J. B. Robertson.

FANCY PANSIES.

Catherine Agnes, Miss Bliss, William Cuthbertson, May Tate, Alexander McMillan, Mrs. Jamieson, James Gardner, Bob Montgomery, Miss Janet Orkney, Mrs. William Stewart, William Stewart, Mrs. T. McComb, Earl of Beaconsfield, Mrs. Barrie, David Wallace, Evelyn Bruce, Edward Caird, Perfection, Mrs. Storrie, William Storrie, Ringleader, Rev. J. Graham, Robert Goodwin, Gold-digger, James Dobbie, J. H. Borrowman, Lady Falmouth, Silverwing, Mrs. Taylor, Mrs. James Watt, Miss G. Boswell.

Preparing for Show.—This is what may be called an all-the-year-round business, for if the exhibitor wishes to make his mark at the show-room he must be all attention, from taking the cuttings from his plants to placing his blooms on the exhibition table. If plants are intended to produce blooms for show, none should be allowed to carry more than three or four shoots. These should be pegged to the ground, and the stalks covered over with fine soil, and, in hot, dry weather, a good mulching of rotten manure placed round each plant; water, when needed, with soft water. The soil round the plants should be stirred now and again to admit air to the roots. No blooms should be allowed to appear on the plants until twelve or fourteen days before the show day; all buds that appear before this date should be pinched off. A dose of weak liquid manure given twice a week when the buds intended for show are forming, will help to increase the size and substance of the flowers, and will also greatly enrich the colours. As soon as the blooms are open, they should be shaded. The best thing for this purpose are caps made of cardboard, tin, or other material; these should be bent in the form of an extinguisher, and should be about 5 inches broad at the bottom, and 3 inches high. A stick should be placed in the centre of each, and fastened at the top with a tack, making them look like a small parasol. These are placed over the blooms when the sun is hot, or in wet weather to prevent the rain from falling on them; dead grass should also be placed all over the bed to keep the rain (should there be any) from splashing the soil on the blooms. Blooms will keep several days in water in a cool room. Those that are likely to keep until the show day should be taken off the plants and placed in basins, with the faces of them hanging over the outside; pieces of paper can be tied round the end of each stalk to prevent them from falling over the sides of the basins. Most beginners get rather nervous on the show morning when staging their blooms. I have seen some fine ones spoilt by clumsy hands. The best blooms are often the most difficult to stage, owing to their substance of petals. I always leave my blooms out of water for an hour or more before I commence to stage them; if the day is cool, two hours will not be too long. By this time they begin to flag, and the petals can be turned about without fear of splitting them. When placed in the tubes among the water they will soon regain their lost substance. They should be staged at least half an hour before the judge begins his business. No slug-eaten or split petals should be staged, for if the judge is very par-

* Applications to Mr. Henderson with stamped envelope should be enclosed to me in an envelope, also stamped and addressed "Mr. George J. Henderson." I will complete the address and forward letters.—ED.

ticular (which he should be) he will certainly disqualify them. Also be careful never to show half-and-half Pansies, I call them—that is, having a blotch too large for a Show and too small for a Fancy—not unless the word Pansies is only given in the schedule, and does not state if they are to be Show or Fancy. Never place two blooms of one colour together on one stand ; put them as far apart as possible ; the exhibitor should endeavour to make as great a contrast as possible. Some make a practice of putting paper collars behind their blooms. I think myself this looks very bad, and adds no beauty to them—rather the reverse. Fancy putting a white self on a white paper collar, "such a contrast." My advice is, let them lie on the stands, which should be painted green, neither too light nor too dark. For the guidance of those who wish to make their own stands, I think a few directions will not be out of place here. Three-eighth inch wood will be strong enough for stands to hold from one to twelve blooms, stronger should be used for eighteen or twenty-four stands ; deal is best for the purpose, as it is light. The stands should be $2\frac{1}{2}$ inches high in the front, and $3\frac{1}{2}$ inches or 4 inches at the back ; each hole for the tubes should be about $2\frac{3}{4}$ inches apart, and 2 inches from the outside hole to the edge of the stand. Tubes for holding water should be made of zinc, and can be ordered at the tinman's, costing about 1s. 6d. per dozen.

Society's Rules.—I here give a set of rules which will be useful should any of the readers of this article wish to start a Pansy Society. Any alterations can be made in them that may be considered necessary.

1. This society shall be called the —— and District Pansy Society, and shall be confined to —— and villages within —— miles of ——.

2. All subscriptions and receipts shall be applied solely to the prizes and expenses of this society.

3. The affairs of this society shall be under the management of a treasurer, secretary, and a committee of members, who shall be elected at the first annual meeting of the society in each year.

4. The society shall consist of members who shall be duly elected at any ordinary meeting of the society ; each member paying an annual subscription of ——.

5. All subscribers of —— and upwards living in the district will be entitled to compete under the same rule as members.

6. All membership subscriptions are due on the first Monday in January, and must be paid on or before the first Monday in ——

7. Any member after paying his subscription will be entitled to vote at all the general meetings during the current year, and to compete, in accordance with the rules.

8. All specimens exhibited for competition must be *bona-fide* the produce of the exhibitor, or have been in his possession at least one month prior, and up to the date of the show.

9. The committee shall be empowered to appoint a sub-committee to inspect the gardens of the competitors, and all articles intended for competition must be shown to them in a growing state.

10. Any member guilty of disorderly conduct in connection with the exhibitions, or convicted of deliberately unfair practices in competing, shall be suspended from membership, deprived of all claims to prizes, and debarred from competing during the pleasure of the association.

11. There shall be —— shows annually. The committee shall have power to fix the entrance fee for exhibitors, and to make all arrangements for and regulations connected with the exhibitions, as well as to make such bye-laws, consistent with the rules, as they may consider necessary for the efficient management of the society.

12. A competent judge shall be appointed by the committee, and his decision shall be final.

13. All disputes which do not come under the jurisdiction of the judge shall be settled by the committee.

14. No alteration shall be made in these rules except at a general meeting of the members.

Regulations for Exhibitors.

1. No person shall show more than one stand in each class.

2. All blooms must be staged by 11 a.m., after which time none will be received. No exhibitor can remove his blooms until —— p.m.

3. No gum or other adhesive substance to be used in showing Pansies.

4. All blooms to be shown on stands painted green.

5. Every exhibitor must deliver to the secretary, at the time of entering for competition, a declaration stating that the blooms are his or her own growing, and that the plants have been in his or her possession for at least —— days, and the exhibitor of any productions not his own growing, shall, on discovery, cause the forfeiture of all his or her prizes.

6. In all classes the blooms must be named as far as correct names are known; the names to be written on a sheet of paper in the same order as they are exhibited on the stands, with the exhibitor's name and address underneath. This paper to be put in a white envelope, and fastened up and attached to the stand, with the number of the class to be exhibited in writing in the right-hand corner.

In concluding, I wish every Pansy fancier success, and if they follow the directions I have given, they can hardly fail to produce blooms that will be a pleasure to look at, and give credit to the grower.

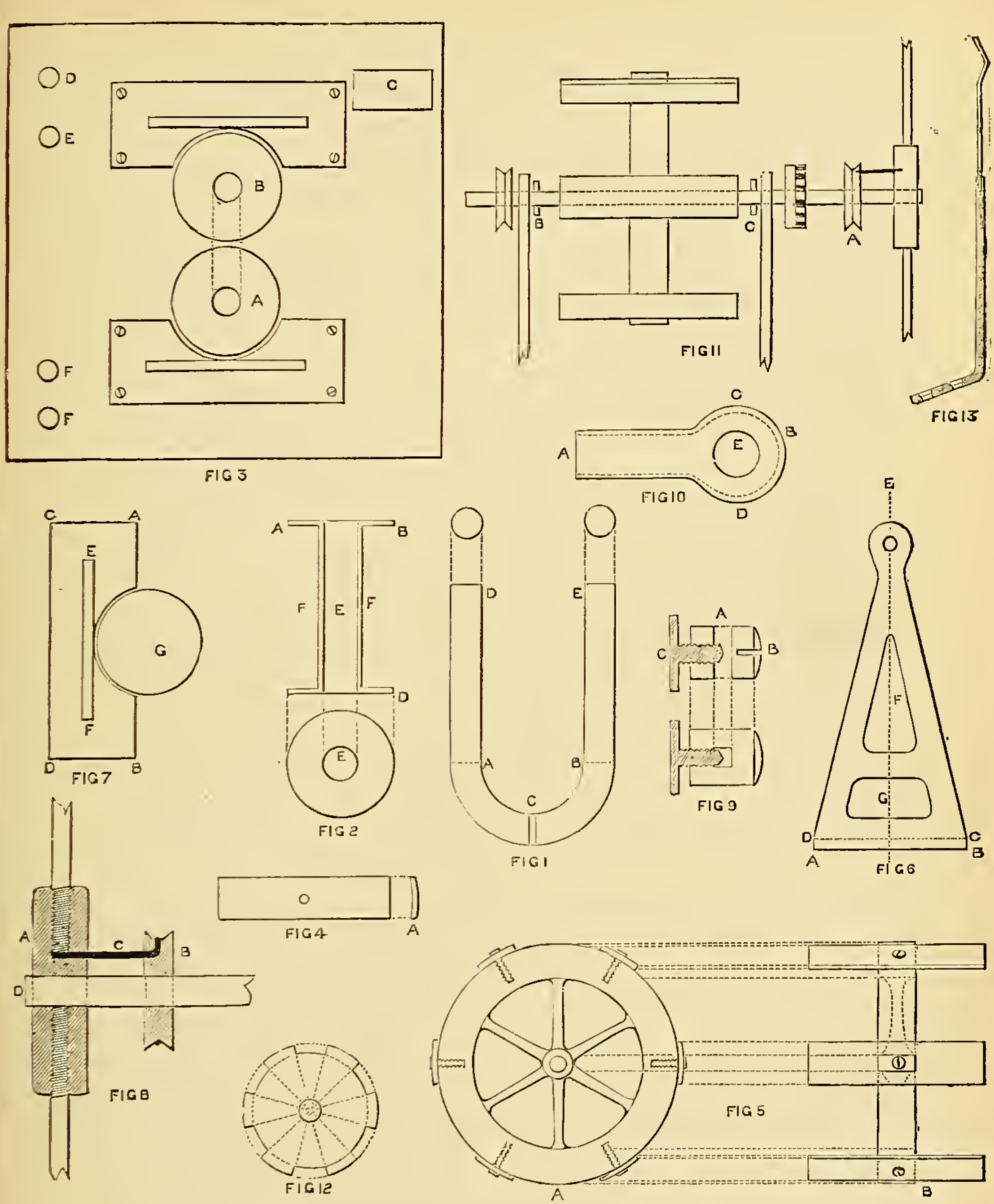
AN ELECTRO-MOTOR FOR REVOLVING VACUUM TUBES.

By LEBASI.

TO such of the readers of AMATEUR WORK as dabble in electricity, I think a lucid description of a small motor suitable for revolving vacuum tubes will be acceptable, especially if from the particulars given they will be enabled to construct a similar article. Of course, as might be expected, there are motors and motors—some very compact and good, others confusingly large and bad, with an enormous amount of lacquer to make up for deficiency in other respects. The motor I intend describing is not one of the compactest, but, on the other hand, I have always found it ready and willing for work, and ever since it was put together it has not been laid up for repairs, though it has done some first-rate service.

Its principle, which is the same embodied in the majority of such models, consists in exciting a soft iron core by means of a galvanic current derived from one of the usual sources of such things, and allowing the excited core either to attract a movable armature or a series of such, or to revolve by the attraction caused by a fixed armature, the current being cut off when the armature and core have arrived at the point when further attraction through the magnetism would only be a drag on the revolving arrangement. This, I think, will be better understood when we have got to the end of our making, which we will now begin.

First, get a piece of $\frac{3}{8}$ inch round iron, $7\frac{1}{2}$ inches or 8 inches long, and bend to shape Fig. 1, the curve A C B being $\frac{5}{8}$ inch radius inside, or the distance between the parallel legs $1\frac{1}{4}$ inch. These legs are cut $2\frac{1}{8}$ inches long from the end of the curve, and the ends D and E filed flat. Or, if more convenient, two pieces of $\frac{3}{8}$ inch round iron, $2\frac{1}{4}$ inches long, may be turned down for $\frac{1}{8}$ of an inch at each end, $\frac{1}{16}$ of an inch less in diameter, and screws cut on the turned part. These may be screwed into a piece of flat iron, $\frac{1}{2}$ inch or $\frac{5}{8}$ inch broad, $2\frac{1}{2}$ inches long and $\frac{1}{8}$ inch thick, two holes being drilled and tapped for the $2\frac{1}{4}$ inch pieces to screw into, and so that when screwed the two pieces are $1\frac{1}{4}$ inch apart, and the whole arrangement stands on the piece of iron centrally. When finished, the iron, no matter which core is made (for what I have been describing is the core), must be thoroughly softened and annealed by being put into a fire and left undisturbed until the fire goes out. If this is got from a blacksmith ready made, it will cost at the utmost a few pence (the price of a pint in the country being most effectual). The two bobbins, one of each of which is placed on each leg of this core, may be made of box, sycamore, or any other piece of well dried and seasoned hard wood. They are $1\frac{1}{8}$ inch across the ends A B, Fig. 2, and 2 inches outside from B to D, the hole E running through them $\frac{3}{8}$ inch diameter, so as to slide on the legs of the core. The space F, F, is turned out so as to leave $\frac{1}{16}$ inch of wood to form the bobbin, which will leave the space for wrapping the wire on $\frac{3}{8}$ inch from the edge of the bobbin and $\frac{7}{8}$ inch long. The bobbins are now filled with wire, silk, or cotton-covered copper, silk covered being by far the best, both as regards appearance and insulation. About half pound of wire will be sufficient for both bobbins. A hole is drilled through one of the ends near the centre, and the wire passed through and then wound on, same as a bobbin of cotton, until the bobbin is filled, and letting the outermost layer finish at the same end as it commenced. The other bobbin is similarly fitted, care being taken during the winding that the silk or cotton is nowhere rubbed off. The bobbins (with about a couple of inches of wire projecting) are now slid on the legs of the core. The roughness of the iron will probably keep them in their places; if not, a piece of paper wrapped round the legs is all that will be required. One end of the wire from one bobbin is to be fastened to one end of the wire from the other bobbin, and so that the current, when passed through the wire, will travel continuously without changing the way it is going round. The best way to get the right wires, is to suppose the core to be quite straight, with a bobbin on each end; then, if the current starts at one of the ends, it must travel in the same direction round the core when it reaches the end of the other bobbin. If it does not, then the connected wire of one bobbin must be transferred to the unconnected wire of the other bobbin, and after this is done it will be found that the current will travel in the required manner. Connect the two loose ends with battery, and try the attracting power of the magnet which is now formed, and if all is right it will be found that it is capable of lifting a pretty considerable weight. If, after disconnecting the battery, the magnet is found to retain any attraction, the iron forming the core has not been properly softened, and it should again be softened. This electro-magnet is now mounted on a piece of mahogany or other wood, using some fancy wood, if appearance is considered, and making the bobbins of same wood to match. The dimensions are 5 inches by 5 inches and 1 inch thick, A and B, Fig. 3, being the position of the bobbins, etc., when mounted. If the bent iron core is used, a recess must be cut in the wood to allow the bobbins to rest level on the wood, or if the other style of core is



PARTS OF ELECTRO-MOTOR FOR REVOLVING VACUUM TUBES.

Fig. 1.—Bent Iron Wire for Core. Fig. 2.—Bobbins to be placed on each Leg of Core. Fig. 3.—Wooden Base for Mounting Bobbins. Fig. 4.—Example of One of Series of Armatures. Fig. 5.—Fly Wheel to carry Armatures. Fig. 6.—Standard fitting into Support for Fly Wheel. Fig. 7.—Support for Fly Wheel. Fig. 8.—Boxwood Holder for Tubes. Fig. 9.—Metal Holder for Tubes. Fig. 10.—Part of Metal Holder for Tubes. Fig. 11.—Arrangement of Standards, Spindle, Holder, etc. Fig. 12.—Contact and Break Wheel. Fig. 13.—Brass Strip on Base Board.

the one chosen, then a space should be cut out so as to make the iron plate forming the cross piece come flush with the top of the wood. It is now screwed down, or in the bent core fastened down from the bottom of the wood with a screw, a hole being drilled, C, Fig. 1, to admit same.

The next portion claiming our attention is the armature, or in this case series of armatures. They consist of six flat pieces of iron, which are screwed on a flywheel such as is used in small model steam engines. These pieces are 2 inches long, $\frac{1}{2}$ inch wide, and $\frac{1}{16}$ inch thick, and a slight curve (A, Fig. 4) is given to them, which extends in the direction of their length, so that when laid across the outside rim of the flywheel, Fig. 5, B, they will bed down close, and, when revolving, allowing the crosspieces to pass closer to the ends of the cores without touching. This curve is best given in forging, or the outside may be filed to the curve, and the side laying next to the wheel left flat, and the rim of the wheel filed flat, so that the pieces may rest firmly in their places. The flywheel is $2\frac{3}{4}$ inches diameter, the rim being $\frac{3}{8}$ inch wide and $\frac{3}{8}$ inch deep, and the hole in the centre $\frac{3}{16}$ inch diameter. Six holes are drilled through the rim from the outside, equidistant, and falling between the spokes of the wheel. These are tapped, and a hole being drilled in the centre of each of the six pieces of iron, each piece is fastened to the flywheel with a small cheese-headed screw, or, better still, with screws having tops rounded off and the head bevelled off underneath, in which case the holes in the pieces of iron must be bevelled also. The holes in the pieces of iron will be $\frac{1}{16}$ inch diameter—at least, slightly more, as a $\frac{1}{16}$ inch tap is used for the holes in the rim. Fig. 5 represents the flywheel with the armatures.

The supports for the flywheel, which come next in order, may either be made out of sheet brass $\frac{1}{8}$ inch thick, or they may be cast, the pattern being made out of wood. If they are cut out, the method is just the same as cutting out of the pattern, a fretsaw being used in each case, a finer one for the brass, and a drop of oil being put on the saw occasionally. Get some $\frac{1}{8}$ inch wood, such as is used for fretwork, and cut out a piece similar to Fig. 7. Draw a line along the wood in the direction of its grain, A B, which is $2\frac{3}{4}$ inches long, then fill in on the wood the rectangle A D, the side D B being 1 inch, and in the centre of this rectangle cut out a piece, E F, $\frac{1}{8}$ inch wide and $1\frac{3}{4}$ inch long, and taking one of the bobbins, place it on the wood, so that it nearly touches the piece cut out (E F) ; mark the wood where it touches, then trace a circle which touches E F, and then cut out according to this second circle. The piece is now cut along the remaining marks, A B, D B, etc. Another piece (Fig. 6) is now cut out. This is $1\frac{3}{4}$ inch across the bottom A B, and is cut along A D and B C at right angles for $\frac{1}{8}$ of an inch. A B is bisected, and a line drawn through the point which divides it in halves, at right angles to A B (the dotted line in Fig. 6), and another line, D C, is also drawn ($\frac{1}{8}$ inch from and parallel to A B). From D C and along the line E, measure off the length of the core of the magnet $2\frac{1}{8}$ inches, and allowing $\frac{1}{32}$ inch for space between armature and ends of core, measure this off also, and then the distance from the centre of the flywheel to the outside of one of the armatures, which will be $1\frac{7}{16}$ inch. This will give a point $3\frac{31}{32}$ inches distant from D C along the line E, and will be the point at which a hole must be slightly marked for future guidance. If castings are preferred, then another $\frac{1}{16}$ of an inch should be allowed for shrinkage, which will make the total distance from D C $4\frac{1}{32}$ inches. From the point thus obtained, describe a circle $\frac{9}{32}$ in radius, and having drawn lines from D and C to the centre of the circle, where the lines cross the circle, fill in with a curve, as shown in the figure. The spaces F and G may now be cut out for lightness. A piece of $\frac{1}{16}$ inch wood should now be glued to each side of the end, and cut out to shape of the $\frac{1}{8}$ inch wood, a hole being drilled through one and placed over the point before being glued on. Where the standard is cut out of brass, a piece of brass $\frac{1}{8}$ inch thick should be soldered to the side opposite to the marked one, thus not interfering with the point marked. The best way to solder them is to clean the sides which are to be fastened with sand-paper, and then having coated them with solder (by putting a few scrapings of solder on with a drop of soldering fluid, and heating until the solder runs), put a drop of soldering fluid on between the two coated surfaces, hold them firmly until the solder is melted and then leave them to cool, holding firmly until the solder is set. When cool, cut out to shape of old piece, and finally clean, to remove all trace of the soldering fluid. The piece, Fig. 6, is now placed perpendicularly in the cut E F, and glued, or if of brass, soldered. If brass, it only requires the hole for the bearing drilling. This is $\frac{3}{16}$ inch diameter, and must be very carefully drilled at right angles to the piece, Fig. 6. If wood, it must be sand-papered and varnished, and two castings made, as there are two standards, both being similar. The castings, when obtained, are filed up, rough edges removed, and the centre of the holes being remeasured, the hole for the bearing is drilled in each casting. Holes are drilled and countersunk for $\frac{3}{4}$ inch wood screws in the bottom part of each standard, to fasten them to the wood base, the holes being represented by the screw heads in Fig. 3.

The spindle or axle consists of a piece of $\frac{3}{16}$ inch steel, or cast iron, $5\frac{1}{2}$ inches long. At $3\frac{1}{4}$ inches from one end the flywheel is to be fastened by soldering to the spindle, first turning the spindle, and with a drop of fluid a blowpipe or iron will make all fast. The flywheel should be bored until it just slides on the spindle; if there is any loose play, it interferes with getting the flywheel fastened square, and making it revolve unevenly.

Our next work is to make the contact and break wheel. This consists of a piece of $\frac{1}{16}$ inch brass, which is cut into a circle $\frac{3}{4}$ inch diameter. A smaller circle is drawn from the same centre, with $\frac{1}{16}$ inch less radius. This circle is divided into six equal parts, and one of these parts divided again into two, one of which is just a trifle larger than the other. A series of six equal divisions is now set off, commencing with the dividing point. Lines are drawn through the twelve points to the centre of the circle, and the brass is cut out as in Fig. 12, leaving the smaller divisions projecting from the inner circle. A piece of ebonite, boxwood, or other non-conducting substance, $\frac{1}{16}$ inch thick, is cut out into a circle, the least shade smaller than the outer circle brass, $\frac{3}{4}$ inch diameter; $\frac{11}{16}$ inch for the ebonite, will be quite small enough. Holes $\frac{3}{16}$ inch diameter are bored through the brass and ebonite in the centre, so as to fit on the spindle. This done, we will now go for the holder for the tubes.

Turn up a piece of boxwood, $1\frac{3}{16}$ inch long and $\frac{5}{8}$ inch diameter when finished, A, Fig. 8, and bore a $\frac{3}{16}$ inch hole through it across the middle, and a hole in the centre of it from each end, $\frac{1}{8}$ inch diameter, one going through to meet the hole bored across, and the other stopping $\frac{1}{8}$ inch off it. A screw is now cut on the ends of two pieces of $\frac{1}{8}$ inch square brass rod, each $3\frac{1}{2}$ inches long, and these pieces are to be screwed in the holes in the boxwood. A small pulley is turned in boxwood, $\frac{3}{16}$ inch thick and $\frac{3}{4}$ inch diameter (B, Fig. 8), and a hole $\frac{3}{16}$ inch diameter bored through the centre, so that when pushed on to the spindle it will stick. If it does not, roughen the spindle with a file in the part where the pulley will finally remain. The pulley is V grooved, and a piece of copper wire fastened round the groove, and brought out at the side (C, Fig. 8). This wire is taken through a small hole in the A piece of boxwood, and one of the brass arms screwed down on it. The other brass arm is screwed down on to the spindle, when it is placed on after all has been got ready. In Fig. 8, D represents the spindle, and the space between A and B is $\frac{5}{16}$ inch. Two holders for the tubes are made as Figs. 9 and 10. They consist of pieces of $\frac{5}{16}$ inch square brass, and $\frac{7}{16}$ inch long. Holes A are drilled through $\frac{1}{8}$ inch diameter, and then squared with small file, so as to slide on the arms of the other part, and holes C drilled and tapped for small thumbscrews, so as to fasten on the arms. Slits B are cut in the brasses to admit two pieces of thin sheet brass, which are cut out as Fig. 10. The length A B is $1\frac{1}{4}$ inch and $\frac{5}{8}$ inch across C D, the end A being $\frac{5}{16}$ inch wide. Two pieces are cut to shape of dotted line, and two pieces to shape of outside lines, and holes E, $\frac{1}{4}$ inch diameter, cut in them. One piece of each shape is put into the slit in the square brasses, Fig. 9, and soldered there, and then put on the two arms, so that the brasses with the holes in are facing inwards and each other.

Place one of the standards on the long end of the spindle, and having threaded on the contact wheels, fasten them there with a wedge loosely and place the holder on the end of the spindle, as in Fig. 11. Now put the other standard on the other end of the spindle and screw them down on the base board, as in Fig. 3. Care should be taken that the segments cut out of the standards are facing each other. A piece of brass, $\frac{1}{16}$ inch thick, $1\frac{3}{4}$ inch long and $\frac{3}{8}$ inch wide, is bent $\frac{1}{2}$ inch from one end (Fig. 13), and a piece of spring thin sheet brass soldered to the other end. This is now screwed on the base board in the position C, Fig. 3. Two binding screws, D and E, are screwed on one end of the board. From the bottom of one a wire protrudes, which is bent upwards so as to rest in the groove in the pulley, A, Fig. 11. A wire from the other bending screw is taken underneath the board to the brass, C, Fig. 3. These two screws should be marked so that the wires from the coil may always be attached to them. Two other screws, E and F (for the battery), are fastened on the board. A wire from the bobbins is fastened to one, and the other wire from the bobbins to the brass, C, Fig. 3. The remaining screw is connected with the standards. These connections should be made underneath the boards for sake of neatness. Two small collars with screws should be fastened on the spindle, inside of and against the standards, to prevent any play backwards and forwards (B and C, Fig. 11). These should be adjusted so that the arms of the flywheel pass easily over the heads of the magnets, and also centrally. The contact wheel now only remains to be fastened. The battery should be attached and its position round the spindle altered until the best effect is obtained. The brass, C, Fig. 3, should *touch* the contact wheel on the rim.

This done, the model is finished. I do not know that I can say anything more about it. If any of our readers find any difficulty in its construction, I shall be very glad to make all clear to them. The chief cost is for the wire, and, including this, the total should not be more than three or four shillings.

A DRAUGHT AND DAMP-PROOF RABBIT-HUTCH.

By AN AMATEUR WOODWORKER.

SO many visitors have asked me how to build a hutch similar to the one pourtrayed in the sketch, that I am glad my note-book contains the particulars of its construction and its cost. The materials, I find, required an outlay of about a sovereign, not a very extravagant sum to expend in the making of a useful and not unornamental adjunct to the town fancier's establishment. The hutch may be used either for rabbits or guinea-pigs, or both. In regard to the former, it is no exaggeration to say that schoolboys ruthlessly slaughter their furry pets by housing them in makeshift habitations. I am no believer in the converted tea-chest, which is so often recommended on the ground of economy; its shortcomings sow the seeds of disease, and are the main cause of disappointment and failure. Rabbits require air without draught, and they are particularly susceptible to damp, which must be excluded. Both these desiderata are furnished by my hutch; and in consequence it is free from the nuisance which condemns rabbit-keeping in the eyes of Paterfamilias, who is adverse to his boys' pets dying of dirt and disease right under his windows. Rabbits kept in a cleanly state are, however, likely to remain in health and in favour.

In designing the hutch, other considerations were not neglected. There are hundreds and thousands of families who in this competitive age are obliged to reside in suburbs where the long old-fashioned gardens are one by one disappearing, their place being taken by diminutive back yards. Nevertheless, boys and girls retain those fancying instincts which have always been the characteristics of the young. It is, however, a hard matter to gratify them, for fowls, pigeons, rabbits, and the like all need room, which is not always to be obtained. For my own part, I have discovered that guinea-pigs, which can do with very little space, are worth the trouble they cause, for it is small. Give them decent quarters, and they can bear a great deal of neglect. They are always clean; they do not encourage extravagant outlays, which pigeon-fancying, for instance, induces: their young ones are always saleable; and, lastly, their hutch may be placed, without giving offence, quite close to the dwelling-house. They have one other recommendation, and that is—they will eat up vegetable and other refuse which, when the kitchener is not alight, so often finds its way into the dust-bin, there to be the source of real danger by giving forth foul gases during decomposition. But whether the hutch is to be tenanted by guinea-pigs or rabbits, makes no difference at this stage, for movable partitions, hereafter to be added, alone are wanting to render the pens suitable for either class of occupant

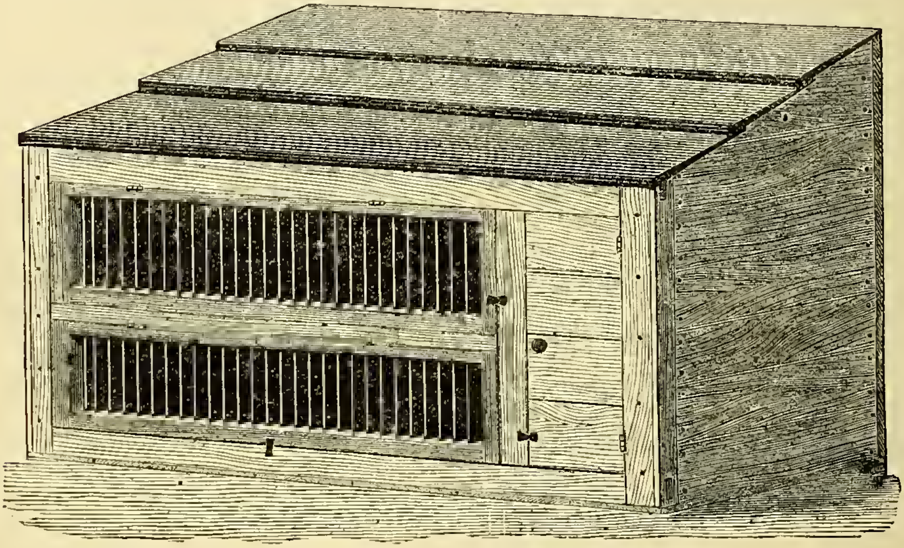


FIG. 1.—PERSPECTIVE VIEW OF RABBIT-HUTCH, COMPLETE.

The dimensions of the house are as follows: Length, 5 feet; width from back to front, 16 inches; height at rear, 31 inches; height in front, $23\frac{1}{2}$ inches. It is important to keep in view that these figures denote outside measurements after all parts have been properly fitted together and planed up.

At the outset, it will be necessary to order at the

nearest wood yard the quantities of wood here given :

16 ft. feather-edge board (for roof) 7 in. wide.
50 ft. run of ½ in. board (for back) 9 „ „
20 ft. match lining (for sides) 5½ „ „
35 ft. of ¾ in. by 1 in. quartering } Already planed
2 lengths of 2¼ in. by ¾ in. „
1 length of 1½ in. by ¾ in. „

The next step will be to take a piece of the 2¼ inch by ¾ inch quartering, and cut off two bits about 3 feet long. These are to form the uprights in Fig. 2, which represent the left-hand end of the hutch. Then saw into pieces, 11¾ inches in length, as much of the match lining as will be needed for covering in the two ends. Be careful to preserve the exact measurement, as by reference to the completed sketch it will be seen that the ends have to be neatly fitted in. Then nail the match lining to the quartering with 1 inch nails. You will then have a slab upon which may be ruled off Fig. 2, giving a fall for the roof from 30½ inches at the back to 23½ inches at the front, by sawing off at that angle. It is also necessary to make the bottom a little out of square, so that the flooring, which will hereafter be nailed to it, may have an incline toward the front of the hutch.

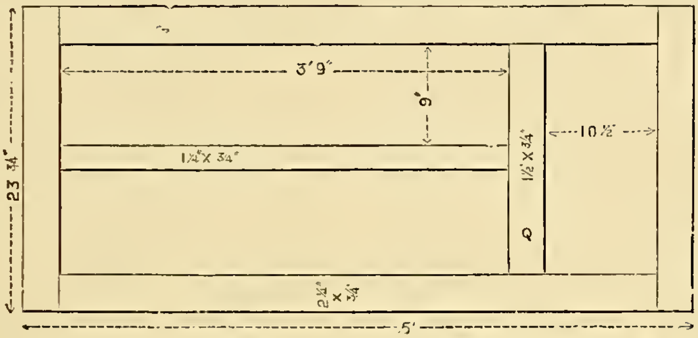


FIG. 3.—DIAGRAM SHOWING FORM AND DIMENSIONS OF FRONT FRAME.

Having made the left-hand end, make one for the right hand on similar lines. The small pieces between the uprights are of ¾ inch wood, and are simply fillets nailed on, not mortised, to lend additional strength, and to support the roof. It is perhaps necessary to explain that the width of the ends (14¾ inches) is thus determined. Total width of hutch 16 inches :—

Width of match lining	. .	14¾ inches.
„ „ boards at back	. .	½ „
„ „ front frame .	. .	¾ „
Together making		16 inches

The front frame above referred to has next to be taken in hand. Fig. 3 depicts the mode of its construction. When complete it is nailed with 2 inch nails to the two ends, and hence it forms the whole front of the house. Its length, outside measurement, is exactly 5 feet. The uprights at each end, and the uprights nearer the centre are of 1½ inch by ¾ inch wood; the rails, top and bottom, are of 2¼ inch by ¾ inch stuff, and the centre rail 1¼ inch by ¾ inch quartering. Fig. 4 shows the mortise and tenon at each corner of the frame. It will be found convenient to wedge, glue up, and nail each corner. The wedges are necessary when the mortise is made full large for the tenon. Fig. 5 gives the centre bar mortise and tenon.

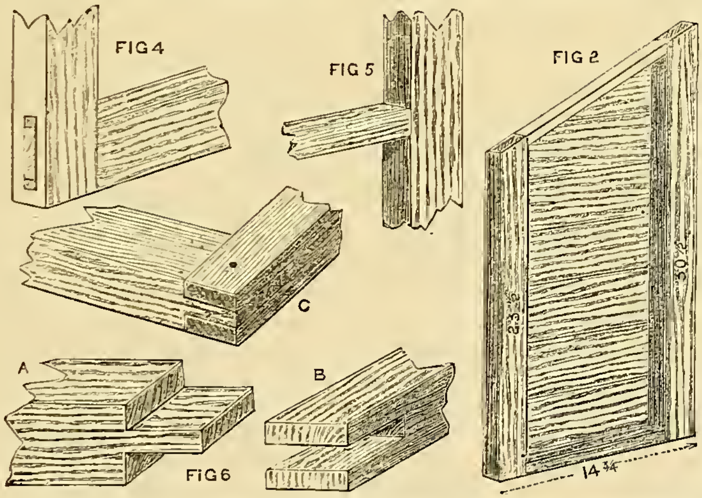


FIG. 2.—DIAGRAM OF SIDE OF HUTCH. FIG. 4.—MORTISE AND TENON AT CORNERS OF FRONT FRAME. FIG. 5.—CENTRE BAR MORTISE AND TENON. FIG. 6.—MORTISE AND TENON FOR FRAMING OF DOORS.

The centre upright or door-post, in Fig. 3, marked Q, must be similarly mortised into the frame 10½ in. distant from the right-hand upright, that being the width of the door to the breeding compartments. Pay particular attention to getting the frame square and ship-shape before nailing the ends to it. Previous to nailing on the feather-edged boards of the roof, you will have to plane off ¼ of an inch from the top rail, in order to allow for the slant of the roof, which will overhang about 1 inch. The 16 feet of feather-edged boards, being 7 inches wide, will just suffice, cut into three lengths. They should extend 2 inches at each end, and over-

lap each other by 1 inch throughout their length. With the roof on, the ½ inch boards for the back may be added, these being nailed on to the ends (Fig. 2). In regard to the flooring, which gives a finishing touch to the stability of the hutch, it is desirable that on the lower tier the boards should, in lengths of 16 inches, run from back to front, as shown in Fig. 1. On the upper tier they may be placed lengthways instead of crossways, but not for the whole extent of the hutch. A vertical fillet of wood must be nailed to the back of the house, but inside it, opposite the door post, marked Q, and to this upright a horizontal fillet must be attached, in order to support the floor boards at such a level that the fall is in the direction of the front, and mainly to left-hand end of the hutch. The object of this arrangement is to ensure a good drainage to this corner, where on both floors is cut a circular hole for the escapement of surface water. To avoid the soakage into the floor boards, so productive a source of ill-health, I have put sheet zinc upon them, and also upon all woodwork exposed to the teeth of the animals. To make the fall still more certain, the hutch is mounted, but not noticeably so, on trestles of unequal height; and to prevent its wobbling, by reason of its slanting bottom, I have nailed on a strip of wood at the back, which compensates for the angle of the flooring, whilst it does not multiply its inner draining slope. The zinc used measured 4 feet by 2 feet 10 inches, and is No. 9 size.

All that remains to be done is to make and fit the doors, observing that the measurements I give are those taken after the fitting process has been gone through; and at first it is desirable to construct them a little but not too large.

The doors are three in number, two of them consisting of frames of 1 inch by ¾ inch stuff, into which are inserted rows of iron bars. Three pounds of iron wire will be sufficient. In Fig. 6, A and B are sketches of the mortise and tenon before they are put together, and C, an illustration of the corner joint when the parts are connected and fastened together. A nail at each corner of the frame will be necessary. The doors must, of course, be made to fit the frame, and if the latter has been correctly measured, and the materials used be of the thickness recommended, the outer dimensions of the doors will be 3 feet 9 inches long by 9 inches wide, thus determined. Nett height of frame 23½ inches :—

	inches.
Width of upper bar, as fitted . . .	2
,, ,, centre sash or bar . . .	1¼
,, ,, lower bar	2¼
Two doors 9 inches each . . .	18
	23½

The inner measurements will be 3 feet 7 inches by 7 inches, the difference being made up by the width of the 1 inch wood used in making the door frames. The wire bars should not be too stout, and should be placed 1 inch apart, and secured in holes by their own tension. They require temporarily to be bent bow shape to get them in position. In each case the doors are hinged by 1½ inch butt hinges from the top to the bars of the frame. In this way access may be obtained to every corner of the hutch, though it should be divided into several compartments.

A third door is hinged in the ordinary way to the right-hand upright of the frame. This door closes in the breeding compartments, and is of match-board nailed to a parallelogram of quartering, in which a wide cut must be made for the floor boards of the second tier to enter, and thus permit of the door shutting tightly. These floor boards rest on fillets of wood (not shown in the sketch) nailed to the end of the hutch, and to the door-post, Q, and interior fillet upright, of which I have already spoken when describing the other parts of the flooring. The same vertical fillet in conjunction with the door-post, Q, will also serve as the means of supporting the permanent divisions wholly closing in, with the exception of entrance holes, the breeding compartments. In like manner, that is by affixing fillets to the hutch where required, other partitions may be made fast, and the hutch adapted to whatever purpose occasion requires. The doors need a "stop," or strip of wood, nailed to the inner side of the frame to prevent them being pushed inwards.

When the last nail has been driven home, the roof and back may be given a coat of tar, of which a quarter of a gallon will be ample; and to all other parts exteriorly two coats of paint will make them weathertight.

As a word of warning I may add that it will be better for the amateur woodworker to keep the sketch of the completed hutch always before him, and to follow out its general plan, for the main object is to make every part fit exactly with its fellows, in order to secure the unity of the whole. Hence the several portions should be put together step by step, so that if a mistake be made, it may be at once detected and remedied. It is very much easier to work in this way than to proceed at random and haphazard, as some amateurs do, forgetting that time and material are both saved by having a thorough comprehension of the several steps that are to be taken in succession, from measuring out the timber for the various parts to putting on knobs, buttons, and the fittings necessary to secure the doors, and finally coating the hutch with tar and paint by way of finish.

HOW TO MAKE A BERCEAUNETTE PERAMBULATOR.

By A PRACTICAL CARRIAGE BUILDER.

VI. — SPEECHING UP OR PUTTING IN SPOKES OF WHEEL—SPOKE BOY AND SHOULDER GAUGE.

THE amateur is now in readiness for speeching up (*i.e.*, putting in the spokes) the wheels, and as all four are done exactly alike, I will describe the details of one for all, only pointing out one or two necessary exceptions as I proceed. Having secured your wheeling frame, as before mentioned, firmly to the bench by bolts or other fixings, force it open with a wedge or lever, so that you can just slip a hind stock or nave into the sunk holes already prepared to receive it, with the smaller side or front of the nave toward you, remove the wedge or lever, and the front upright springs back to position and grips the nave, which, if fitted into countersinks, as described, will allow of turning round while mortising and speeching, and also keep nave in its place while knocking out the mortises.

The nave now in its position, put the two screws or bolts into ends of the crossbar, and screw up tight enough to require some amount of force to turn the nave round. The spoke holes being marked in with compasses on the line, now take a quarter inch centre bit, and set in at each mark, just far enough inside the line that the circle made by the bit misses it $\frac{1}{8}$ inch. The face of every spoke having to be flush with this line all round the nave, bore down $\frac{1}{4}$ inch with centre bit, and finish down to centre of nave with an ordinary $\frac{1}{4}$ inch spoon bit. Do not try to go full depth with the centre bit, or it will choke itself, and you will have difficulty in withdrawing it; and note this, in boring these holes, or cutting the mortises, do not use grease or oil of any kind whatever, for the presence of the least of this in a mortise will soon cause your spokes to work loose and spoil your wheel. Should you make a mishap and cut the mortise too large, you may dip the tenon of spoke into glue just before driving, but this is quite unnecessary in a well-fitted spoke, and should on no account be admitted, except in case of accident.

Glue is used in wheelmaking in America, but is a great mistake, in my humble opinion.

Well, having bored the first hole down to the centre of the nave, insert a round nail punch, and use as a lever to turn the nave, bringing the next hole to be bored into position, always being careful to bore each hole perfectly upright every way; a little practice will soon accustom the amateur to accomplish this easy but very necessary precaution.

The holes all bored, now take a spoke and place the bottom end of tenon just over each hole in succession, but with front of it exactly touching the line before mentioned, with a fine-pointed scriber; mark closely and carefully along both sides and back of tenon on the nave, having done which, now take a chisel ground to a nice long bevel and well sharpened, and $\frac{1}{4}$ inch wide and thick, or thicker if you have one; with this proceed to cut out the mortises, commencing by cutting away the side of the hole farthest from you. When standing with your face in front of your work, and looking toward the back of the nave, leave the side and back lines untouched, but cut dead up to the front line and incline the bottom of back of mortise towards the front, so that the mortise is shorter at bottom; this part of nave being the strongest it will grip the tenon much tighter. Be sure the sides are quite parallel, but if any difference, smaller at bottom than top, the front end of mortise perfectly square up with axis of nave; do not cut down lower than the centre, or else when the first mortise has been moved round until it is quite under, and you are cutting its opposite, your chisel may slip through and damage the one already cut. Having cut these out all round the nave, eight in number, now fit in one spoke to the uppermost mortise, but take care the tenon is not quite long enough to reach its opposite neighbour, or it will force the other out when driven home; having driven the first spoke home, miss the next mortise and drive in the next spoke, repeat this until every other spoke is driven, so that you will have four spokes driven with one mortise between. This is another important wrinkle, for were the spokes driven in succession, the nave would split in halves before they could all be got in, but leaving one space between each, will prevent this almost certain result. Having put in half the spokes, now proceed with the others, but take care to examine the bottom of each mortise, and if any parts of the bottom ends of the tenons of the spokes on each side should project into the mortise, cut them quite level with its sides, or this again may cause the nave to burst on one side, perhaps both. Now, in making such wheels it is necessary they should be dished, that is, the spokes should incline a little forward, in this case $\frac{1}{4}$ inch will be enough, so that a straight-edge laid across and resting on the extreme outer ends of spokes, it shall not touch the shoulder end or face by $\frac{1}{4}$ inch, this must of course be done while driving, to effect which a gauge, called a spoke boy, Fig. 23, must be used. This is a piece of ash or any hard wood, about $\frac{3}{4}$ inch wide, $\frac{1}{4}$ inch thick, and 15 inches long; about 1 inch from the bottom end bore a hole with a $\frac{1}{4}$ inch bit, to take a 1 inch No. 12 wood screw; now with a gimlet bore a hole for this screw to enter into

the outside of front upright of the wheeling frame; now take a screw, as stated above, and slip on up to the head a small iron washer, then put it through hole bored in the piece for the gauge, and screw it tightly up to the wheeling frame, so that it can be moved stiffly right or left round its centre; and mind this centre is exactly concentric with the centre of the nave, as truly as though in the nave itself. The amateur cannot fail to see the importance of this as we proceed. Having tested the gauge as directed, withdraw the screw and take off the strip of wood and mark a point 12 inches from centre of hole already bored, and with a large bradawl bore a hole square through it, in its centre. Now get a thin slip of whalebone and reduce it till it will pass stiffly through this last hole, and long enough to reach quite up to the line on the nave that the fronts of your spokes touch, this can be easily found by measuring; now cut off its inner end $\frac{1}{4}$ inch, the inclination of the spokes secure it firmly in this position, and don't alter it on any account, or the wheel will not be true; now insert the screw with the washer as before, fix tightly and it is ready for use. Bear in mind this must be all done before one single spoke is driven. Now for the *modus operandi:* push the spoke boy round to the left of you, out of the way, while driving the spoke; drive the spoke about half way in, bring up spoke boy parallel with it, and see if the end of the whalebone just touches the front of spoke; if it does, push boy to the left again, drive home spoke and try again if all right, proceed with the next, and all other spokes. If front of spoke does not come forward enough to touch the gauge point, pull it forward and drive till it does, if too far forward, push away from you and drive as before; in this way all the spokes are set truly with each other.

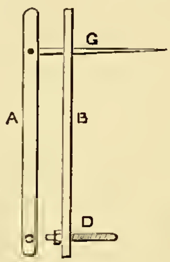


FIG. 23.—SPOKE BOY.
A, Front; B, Inside; C, Whalebone Point, D, Set Screw.

FIG. 24.—SHOULDER GAUGE.
P, The Marking Point.

A piece of stout wire or a small strip of wood will do for the gauge point with these drawbacks—if wire should come in contact with driven spokes, it would bend and need readjusting, and a slip of wood would be liable to break, but whalebone would only bend to any obstruction and spring back to former position when released.

The eight spokes now being in position, the next job is to cut the shoulders at the top of each spoke and form the tang or tenon, upon which the felloes are fixed, for which two other gauges are required. First, the shoulder gauge, Fig. 24, which is a piece of thin wood, $\frac{1}{2}$ inch wide, with one end, the bottom, bevelled to a featheredge like a chisel, one side quite flat, and all the bevel cut on the other, so as to allow the flat side to rest on the outside or largest diameter of nave, and close up to side of spoke; now get a fine bradawl, sharp it up to a nice long keen point, and put it square through the other end of this piece, the point to project about $\frac{1}{8}$ inch on the flat side and exactly the distance from the bevelled end the shoulders on the spokes are to be, which will of course be $\frac{3}{4}$ inch less than outside diameter of the wheel finished. To use this gauge, put the bottom end on nave close up to side of spoke, and keep it there with one hand, while with the other take the top end and move it to and fro on the side, till it scratches the shoulder of the tang, repeat this on each side of each spoke till all shoulder lines are thus marked off; then with a sharp saw set in at these marks, cut carefully all round the spoke, $\frac{1}{16}$ inch deep. The other gauge is a piece of hard wood, about 2 inches square, $\frac{1}{2}$ inch thick, through centre of which bore a barely $\frac{1}{2}$ inch hole, or perhaps $\frac{7}{16}$ inch will be best. Now cut all your tangs down round in form and small enough to allow this last gauge to push stiffly on down to shoulder, repeating all round; the tangs will then be all one size, and the felloes will fit nicely if the holes in them are bored truly square through. The tangs all cut, now take a felloe, and resting its inside on shoulders of two spokes, so that the felloe is, as it were, divided into three parts, an equal length projecting beyond each spoke; now mark exactly where the centre of each tang comes, and with the $\frac{7}{16}$ inch bit with which you bored the last gauge, bore two holes in the felloe in a direct radial line from centre of wheel, taking care they are exactly in the centre of thickness of and bored through from inside of felloe; now fit it down on to shoulders of both spokes, when cut off both ends of felloe square through, but following the radial line of wheel to centre, which line can be found by setting a bevel blade to cross line of the board you drew the diagram upon for making felloe up by, and holding the stock of the bevel up to inside of circle, where it will be found to touch the circle at two extreme ends. Take care in cutting off ends to ensure the end which is left of felloe is exactly half-way between its own spoke and the first spoke of next felloe, as wherever the joints are placed, they should be equidistant from the spoke each side of them.

Taking felloe No. 2, cut its end to fit one end of the one already fitted, by laying it on its own shoulders and butting up to other; when fitted, again mark the tang holes in, bore, fit and fix as before, and so on all round, after which cut all the tangs which project

beyond, down level with outside of the rim, as it is now called, and with a thin $\frac{3}{8}$ inch chisel make a little split in end of each to receive a small wedge, both split and wedge to be put across the grain of the wood of felloe, on no account in a line with grain, or it will split the felloe all along.

Now make sufficient wedges, about 1 inch long, $\frac{5}{8}$ inch wide, and just tap them in far enough to hold each felloe tight down to shoulders on spokes; if the felloes butt too hard on each other at joints, and do not come down on shoulders of spokes, run a saw quite through all felloe joints till they do fit, and tap wedges in a bit tighter when all are down and joints fit, again cut through all four felloe joints, leaving a space quite through, the thickness of the saw, to allow for contraction of tyre. Now mark each felloe to its own pair of spokes, knock them off and mark with carpenter's gauge the centre of each end of felloe, and with a large bradawl, or small gimlet, make a hole $\frac{1}{8}$ inch diameter, $\frac{5}{8}$ inch into each end of felloe, to receive the wire dowels, for which cut off some wire $\frac{1}{8}$ inch diameter, into 1 inch length, sharpen the points of these and drive one in one end of each felloe, so that the dowel in end of one may enter hole in end of its immediate neighbour. The dowels all in, now put one felloe on to its proper pair of spokes and tap it just halfway down to shoulders; take next felloe, just enter end of dowel in last one into its hole and tap on, as before; when all are thus just started on, turn the wheel round and round, gently tapping all down to their places, when drive in the wedges for good, cut them off level with rim, level off all the joints, and just regulate outside of the rim, but do not remove the humplike appearance of the joints of felloes. Only with $\frac{1}{2}$ inch gouge cut out the ends of spokes a little below the surface of the sole or outer edge of wheel, or when the tyre contracts in cooling, it will bend and perhaps break some of the spokes.

Having now got one hind wheel completed and ready for its tyre, take it out of the wheeling frame, and do the other every way the same, after which, proceed exactly with the smaller front ones. With these exceptions, that as the front naves are smaller at middle and back, they must be mounted in the two countersunk holes on the left side of the wheeling frame. The spoke boy must be altered to suit the shorter spokes, as also the shoulder gauge, and of course the felloes will be shorter and a different compass, but these little alterations will, I trust, now be quite within easy reach of the persevering operator.

In speeching up, cutting mortises, and fitting felloes, it is always best to work from right to left, as it leaves the right hand greater liberty of space to move in its more numerous actions than the left is called upon to exert. I am, of course, speaking of a right-handed man. One accustomed to make the left hand the principal agent would perhaps find it easier to work in the opposite direction

(*To be continued.*)

WATCH CASE FOR MANTELPIECE.

By G. BALL.

(*For Illustrations, see Folding Sheet issued with this Part.*)

AS cabinet making on a small scale always affords excellent practice, I will endeavour to do my best with illustrations and words, to show amateur wood-workers how to begin and complete a useful little piece of ornamental furniture for the mantelpiece—namely, a small time-piece to be used with watch, or, in simpler terms, a watch case. I daresay some of our readers may think when they look at the illustration and the case complete, as given in the Folding Sheet, that it is too small an article of furniture for an amateur to take in hand; but I can assure those that may wish to try to make it, that it is not so, for I have endeavoured to make the design as simple as can possibly be, so that any amateur of average skill may make one if he wishes. Any one who does so will find it to give satisfaction when finished, and that it will be allowed by his friends to be an ornament to the chimney piece.

Although spring is now with us, and summer fast approaching, home workshops yet possess a charm for their busy owners, at least, for most of them. So we must still endeavour to suggest work to each other, and to help one another out of any difficulty when it is in our power to do so, and what one man does not know, another is sure to be wise enough to know it; but at times we find, unfortunately, that some of the wiser ones are not willing to let any one else know as much as they know themselves. That, I think, is not the thing, but rather, as the old saying is, to help one another, so in this matter of the watch case, and in anything else for that matter, I will try and help any one as far as lies in my power, by imparting a little of the knowledge I myself have found through experience. I am quite sure that every one who writes in AMATEUR WORK tries his best to supply every amateur with the best information he possibly can. In looking through the pages of the magazine, I notice that those who seek for information are always supplied with practical teaching, which is the best form of instruction that an amateur can have, for it gives him a chance of making and finishing the article

he wishes to construct, with as good a finish to the eye, as any article that can be seen in shop windows. It is natural for all people to wish to make their homes look as well and comfortable as they possibly can, and I am quite sure that with AMATEUR WORK they can do so.

For any piece of furniture that is required, information is always ready, and so every one is enabled to make what he wishes. Some people say, or at least may think, that AMATEUR WORK opens up trade secrets—in fact, I have heard people say, "I cannot tell you how to do so and so, because it is a trade secret;" but what dogs in the manger they must be. It is not live and let live with them, but all self; people of that kind would make you believe that if they told you anything they knew, they would be the poorer themselves for it.

I have said my say on this subject intentionally, because I am not an "amateur" myself, but a professional wood-worker; but I never yet found myself worse off for trying to help others with a little professional knowledge, and as far as my own trade goes, I am free to allow that I have picked up many a notion from the magazine that has been of use to me, to say nothing of information with regard to matters which are outside my trade, and about which I have not known as much as I could wish.

We will now turn our attention to Fig. 1, in which you will see the watch case complete. All drawings are full size. In order to make it we shall require, first of all, four corner-pieces, as Fig. 6, planed up to $\frac{1}{2}$ inch square, 8 inches long, set out at top as in Fig. 12, and with feet on bottom end, as in Fig. 10; this is now ready for the turner. Fig. 6, A, shows the next pieces: these must be $\frac{7}{16}$ inch square and 4 inches long, set them out and get them ready to take to the turner; but if you have a lathe and can do them yourself, so much the better.

After the caps and feet have been turned on Fig. 6, cut out for the reception of the pillar in Fig. 6, a piece as marked W, in Fig. 6; after this is cut out take Fig. 6, A, and glue tightly into its place. Do this with each of the four pieces, and then the corner posts will be finished. The slot marked O in Fig. 6 is cut out for attachment of bottom rail B, in Fig. 1, each end of each piece at front, back and sides, being fastened into the legs at the back.

The top is the next piece we require. This is made out of stuff $\frac{3}{4}$ inch thick, $2\frac{1}{4}$ inch wide, 5 inches long, and is moulded on front and two ends, as shown in Fig. 11, with a groove cut underneath front edge and left hand end, as shown in Fig. 11. The groove is to receive front and end. The dotted lines from Fig. 10 to Fig. 11 show front in its place; after this is done cut out $\frac{1}{2}$ inch square out of each corner to receive the top of the four legs, as shown in Fig. 7. The round mark in Fig. 7 is for small dowel; bore a small hole, say $\frac{1}{4}$ inch, then get a piece of wood $\frac{1}{4}$ inch round and about $\frac{3}{8}$ inch long, fix on one end firmly in the hole in Fig. 7, the other end to project out about $\frac{1}{4}$ inch, a hole is then bored in a distance from the top of Fig. 6, as shown by dotted lines marked Z. Then when the legs are in their places, the top will be held firmly into its place against the legs.

We will next direct our attention to the bottom rail B in Fig. 1. B, in Fig. 10, shows a section full size; allow it long enough to cut a tenon on each end to fasten into the bottom of legs (or upright pieces). The frame now had better be put together, but not fastened for good.

The front is the next piece that must be made. This is formed of stuff $\frac{3}{16}$ inch thick, cut out with the fretsaw as shown in Fig. 2. The hole in the centre to be cut the size of watch, which projects through front, as shown in Fig. 9. Fig. 3 represents the end used as door on right side, hung with small brass joints as shown. The left hand end must be $\frac{1}{4}$ inch larger top and bottom than shown in Fig. 3, to fit into top and bottom rail of case. Fig. 5 is a strip $\frac{3}{16}$ inch thick, cut out as shown, and glued into large groove made in front of the bottom rail to receive it, as shown at C in Fig. 10. Fig. 4 is cut out of stuff $\frac{1}{4}$ inch thick: it is made exactly to size and let into top of back uprights, as E in Fig. 1, forming a back to the shelf made by the top. Fig. 8 shows the form of the brackets on each side of top, made of wood $\frac{1}{4}$ inch thick, with small wood pin let in as shown, to fasten into upright and top of case.

When all the parts are ready, glue them well together with good glue. Do not on any account use nails or screws, but make the whole thing fit firmly together before gluing; a little coloured silk glued tightly at the back of the ends and front prevents sight into the case, and gives it a good appearance. The back of the case can be made of plain wood, because it is not seen; it should not be dispensed with, as it prevents dust from getting into the case. Cut a small piece of wood on which to rest the watch when put in its place, as shown in Fig. 9, which exhibits the watch in its position; the case will now be complete.

Plain oak is very suitable, and looks excellent for this purpose. If it is desired to make it look like old oak, mix a little Japan varnish with turpentine, rub on with small piece of flannel until as dark as required; if a polished case is preferred, use French polish in the usual way. The case will also look extremely well if finished in black and gold. In doing this the whole of the woodwork should be ebonised with ebonising solution; for making which several ways have been described in "Amateurs in Council."

Lamp black mixed with glue size makes a very good dead black; to brighten any part in dead black use best hard oak varnish. The gilding must be done after varnishing or polishing, and must be the last job. Gild to taste. The best gold for an amateur to use is gold paint, bought in small bottles at 1s. each. Gilding with leaf gold is rather a hard job for an amateur to undertake unless he has the right tools to do it with.

HANDY WORK IN FARM AND GARDEN.

By GEORGE EDWINSON.

V.—MAKING AND REPAIRING GATES, WICKETS, STILES, ETC.

WHEN a farm or an estate is divided into fields and similar enclosures by high fences, some easy and portable means of communication between the various sections becomes necessary; and there are none superior to that of the ordinary field-gate. Draw-bars and movable rails are sometimes provided in rail fences, but these must be regarded as makeshift affairs, contrived to avoid the expense of making gates.

Field-Gates.—Fig. 43 shows the form of an ordinary field-gate, frequently met with in the western counties of England. The design of this gate is wrong in principle, since all the front part of the gate is connected by a slanting stay with the back stile, and the weight of this part is borne by the top hanger or hinge of the gate. The whole of the front part of the gate is therefore designed to act as a lever on the top hanger, with the bottom hanger as the fulcrum of the lever, and the result is as one might expect—the top hook is frequently pulled out of the post, and the post itself loosened by cattle leaning their necks on the front of the gate, and children swinging on it. An improved form is therefore shown at Fig. 44, in which the useless bent top of the back stile has been dispensed with, and an additional stay introduced to take the weight of the front stile and bear it on the lower part of the back stile. This is a strong form of field-gate, and the cost of it will not exceed that of the old form. It is made of well-seasoned oak as follows: Back stile, 4 feet 7 inches by 4 inches by $2\frac{1}{2}$ inches of sawn, well-seasoned oak. Cut socket mortises for ends of rails, $2\frac{1}{2}$ inches long by 1 inch wide by $2\frac{1}{2}$ inches deep. Mark the mortise for top rail 7 inches below the top of the stile, then mark the others as shown in the following diagram:

```
 7   3   9   3    9   3   6   3   5   3   3
(---|--|----|--|----|--|---|--|---|--|--)
```

The front stile should also be of sawn oak of the following dimensions: 4 feet by 3 inches by $2\frac{1}{2}$ inches. This should be marked for mortises as shown below:

```
 2  3   9   3   9   3  6   3  5   3  2
(--|--|----|--|----|--|---|--|---|--|--)
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The top and bottom rails should be of straight well-seasoned oak, 9 feet 6 inches in length by 3 inches in width and $1\frac{1}{2}$ inch in thickness. The three middle bars or rails should be of the same length and width, but may not be more than 1 inch in thickness. The top and bottom rails may be tenoned into their mortises, as shown at Figs. 45 and 46; but it is not necessary to cut the tenons as here shown. In many most excellent field-gates, the ends of the rails are chopped with a hatchet, and tapered just enough to fit them tightly in their mortises. When all the rails have been fixed in their places, holes are put through both stile and tenon with a $\frac{1}{4}$ inch centre bit, or large gimlet, and an oak peg driven firmly into each. In many cases, the stays are secured in like manner to the rails, whilst other makers prefer the use of nails. A socket mortise is one cut only one-half or two-thirds through the wood, as shown in Fig. 46. Instructions for cutting mortises have been already given in a previously published article dealing with the manufacture of hurdles. The stay connecting the top of the back stile with the bottom of the front stile, should be cut from such wood as that used for the middle rails. It is to be fitted and pinned into a slot cut for its end in the top of the back stile, and should be partly let into the bottom of the front stile in a manner similar to that of its companion stay. The main stay, supporting the front of the gate, should be cut from such material as that used for top and bottom rails. It is let into the bottom of the back stile far enough to bring it to bear against the rails, and is partly let into the top rail in the manner shown by the sketch, Fig. 44. It is then secured to the rails by pins or nails, as preferred.

The next thing to be considered is hangings and fastenings for the gate. The best and most reliable form of hanger is that shown at Fig. 48. It is made out of one piece of flat bar iron, bent double, formed into an eye at the bend, and welded together at this part; the two arms are then sprung apart whilst hot, and forged into the form shown. Holes are then drilled and countersunk to receive screws, and the arms are made to clasp the gate as shown at Fig. 44. Some makers pass a small bolt through the gate to hold the ends of the arms, and thus make them secure. Before the hanger is put on, it will be necessary to nail on a few strips of oak packing to each side of the rails, to fill them out to the width of the arms of the hangers, and it may also be necessary to trim off a bit of the stay. Fig. 49 shows the form of a

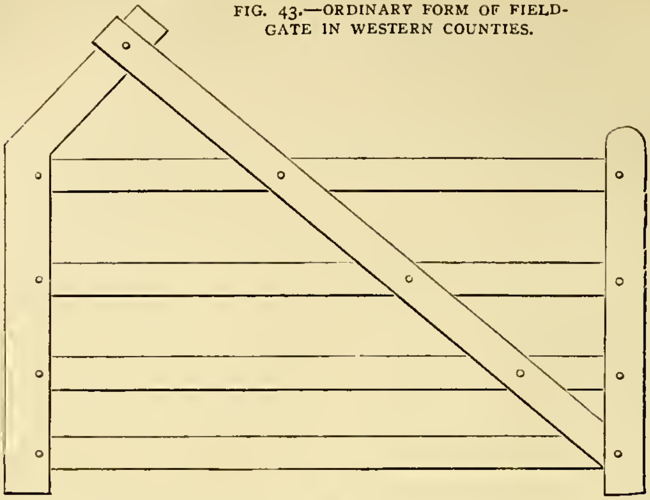

FIG. 43.—ORDINARY FORM OF FIELD-GATE IN WESTERN COUNTIES.

crook much used in farm work. It is forged out of a solid bar of iron, and driven, red hot, into the gate post. It is a most unreliable support for a field-gate, and is frequently drawn out when pressure is applied to the front of the gate. An improved form of crook is shown at Fig. 50, in which the shank is made into the form of a bolt, made to pass through the post and secured in position by a nut and collar. When pigs are allowed to roam about the farm, they soon acquire the knack of lifting a gate off its hinges when they want to pass from one field to another. To check this swinish propensity it is necessary to drive a nail or a spike into the back stile under the hanger, so as to protrude from the stile beneath the crook, when the gate is shut. A spike formed for this purpose is shown at Fig. 51, whilst Fig. 52 shows an improved contrivance for the same purpose. This is merely a piece of flat bar iron bent at right angles, drilled with two holes, and fixed by screws to the back stile.

Many and various are the forms of fastenings for a field-gate. A primitive but very useful form is that of the wooden latch shown in the sketch, Fig. 44. This latch is merely a piece of tough oak, such as a piece from the material used in the rails of the gate. It is secured at one end by a stout screw, on which it freely swings, the other end is supported to the front stile by a latch-guard of oak, cut to the form shown, Fig. 53. This end of the latch is allowed to protrude some 3 inches or 4 inches beyond the end of the gate, and falls into an oaken or ash catch driven into the front post, and formed as shown, Fig. 54. A substitute for this latch, made out of iron entirely, is shown at Figs. 55—58. It is made in the form of a spring attached to the end of the gate on the upper part of the front stile. This spring is kept in place by the guard, Fig. 56, and engages with the catch, Fig. 55, when the gate is shut. Clever horses have been known to open gates furnished with those latches, and learned pigs will spring such gates open with their snouts. It is therefore advisable to furnish a gate with a hasp and staple, in addition to a latch.

The hasp, Fig. 59, and the staple, Fig. 60, are the most common forms, and these can be easily made by the amateur smith out of a length of rod iron. When, however, it is found necessary to secure a gate from being opened and left open by trespassers and careless persons, we must have recourse to another form of hasp, made to receive a padlock. Fig. 61 will show such a hasp made out of a piece of fencing wire bent into the required shape. This is not, however, suffi-

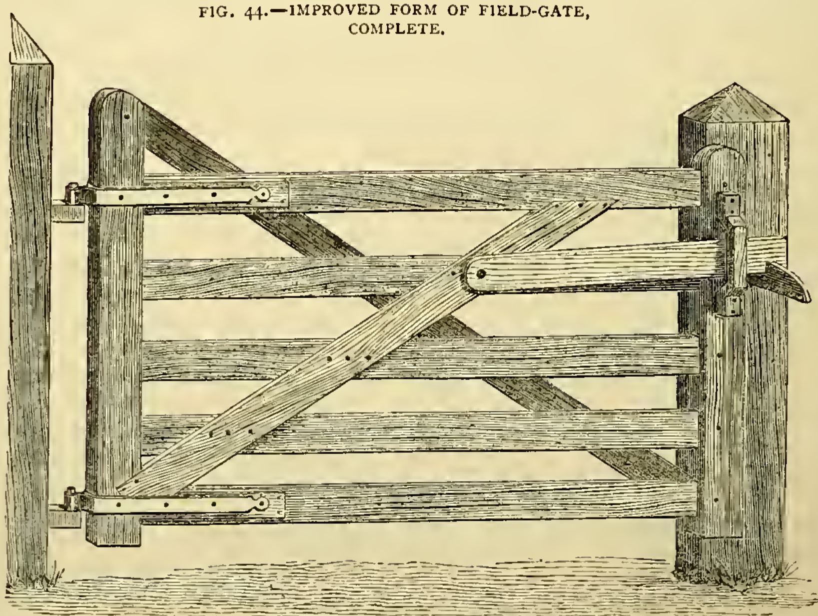

FIG. 44.—IMPROVED FORM OF FIELD-GATE, COMPLETE.

ciently secure, for the hasp can be easily sprung and the staple drawn. It is best, therefore, to weld the eyes of the hasp, and to weld a small bolt to it as shown, Fig. 62. This can be securely attached to the front stile, whilst a staple made as shown in Figs. 63 and 64 can be secured by screws to the front post. The best method of making these and similar gate fittings will be given in the articles on "Smithing and Forging."

Hanging a Field-Gate.—This is a matter of importance, and some little difficulty. The gate must be hung in such a manner as to admit of its being opened in the most advantageous way for ingress and egress. It should always open into a field, but never into a road. If fixed in the corner of a field, it should open against one of the fences, and should only open one way. If possible, it should open from the front post to the right hand when pushing the gate, and, when forming a communication between hilly fields, it should open down hill rather than up hill. The posts should be of oak, heavy in the stock, and prepared as directed for the posts of rail fences; the stocks should enter the ground at least 4 feet, and the back post should be not less than 8 inches square above ground, the front post not less than 6 in. The tops of the post should be tapered as shown in sketch, to throw off all rain and moisture. The back post is that to which the gate is hung, whilst the front post bears the fastenings. If the ground is shallow, and it is found difficult to dig post holes through the rock to desired depth, it will be found advisable to bury a substantial threshold of timber beneath the soil between the two posts, fitting this as a frame to the posts and thus connect them together. This should be done whenever the stability of the posts is suspected. Field-gates should have a clear way of at least 10 feet between the posts, and this should be the length of the threshold. A latched gate must be hung in such a manner as to secure a fall to the front post of sufficient force to latch itself when left half shut. To do this, the

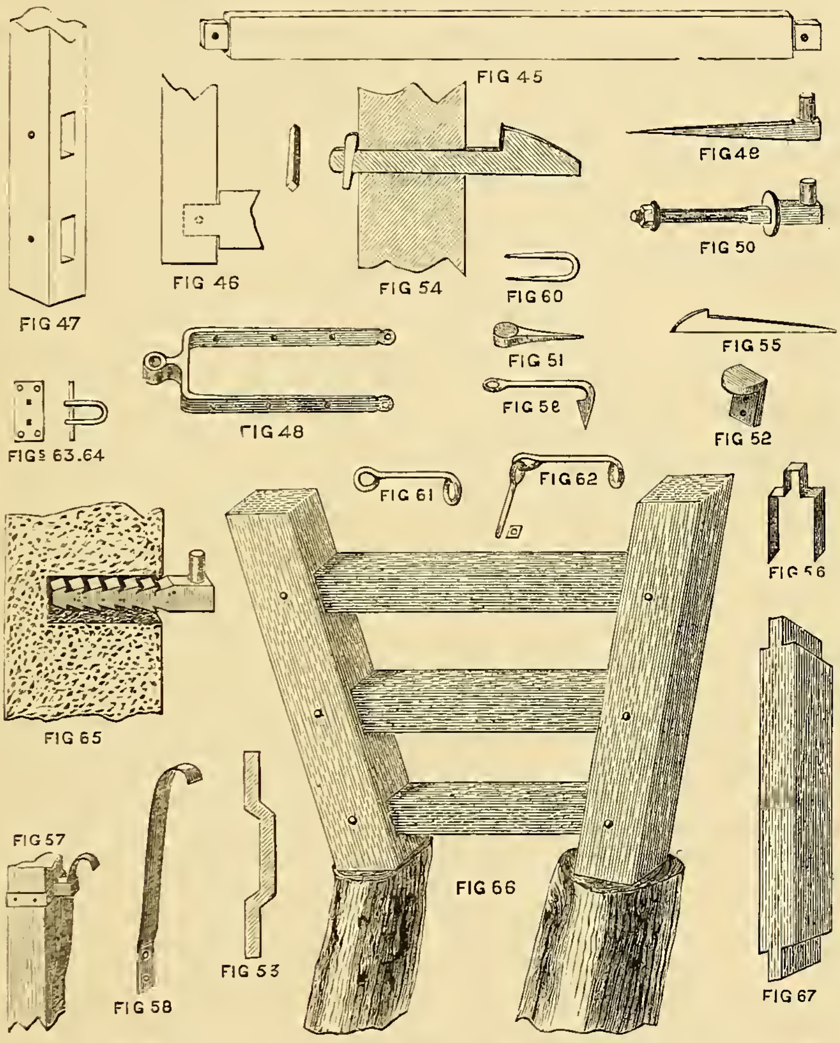

FIG. 45.—MORTISED RAIL FOR FIELD-GATE. FIGS. 46, 47.—DIAGRAMS OF SOCKET MORTISES. FIG. 48.—HINGE. FIGS. 49, 50.—CROOK. FIGS. 51, 52.—SPIKE AND BRACKET TO PREVENT GATES BEING UNHUNG. FIG. 53.—SECTION OF LATCH GUARD. FIG. 54.—SECTION OF POST SHOWING HOW TO FIX WOODEN CATCH. FIG. 55.—IRON CATCH FOR LATCH. FIG. 56—GUARD FOR IRON LATCH FIGS. 57, 58.—IRON OR STEEL SPRING LATCHES. FIG. 59.—HASP. FIG. 60.—STAPLE. FIG. 61.—HASP OF IRON FENCING WIRE. FIG. 62.—HASP FOR PADLOCK WITH EYE FORGED TO IT. FIGS. 63, 64. IMPROVED FORM OF SAFETY STAPLE. FIG. 65.—SECTION OF STONE POST SHOWING SOCKET AND CROOK. FIG. 66.—COMMON FORM OF OAK STILE. FIG. 67.—RAIL FOR STILE.

bottom crook must not be put into the back post plumb with the top crook, but should stand out of the perpendicular line, some one, two, or three inches, according to the fall required and the position of the gate. The deviation must be from the pushing side of the gate, and it is better to make this deviation than to lean the back post. In districts where large masses of granite are attainable, stone posts are in use, and to these the crooks and other fastenings are attached by two different methods. 1. A hole, 2 inches in diameter, is cut through the back post for each crook, and into each hole is fitted (and driven tight) a plug or billet of oak or other durable wood ; this plug is pierced with a hole for the tang or shank of the crook, and the crook is driven into it as in a wood post. A similar arrangement is made for the fastenings to the front posts. If shanks are forged to the crooks and other fittings, and these are screwed to receive nuts, as shown at Fig. 50, this method of attaching the fittings is superior to that usually adopted, as described below, for, by using a large back collar under the nut (one of sufficient diameter to cover the end of the plug and grip the stone), the crook cannot be pulled out, and, should it be broken off in the post, it can be easily repaired, or a new one substituted. 2. The shanks of the crooks and other fittings are forged massive, as shown at Fig. 65 ; sockets are bored to receive these, as shown in the figure, and the fittings are secured in their places by molten lead poured into the sockets after the fittings have been placed in their proper position.

Where oak cannot be obtained, the wood of larch or other fir wood may be used in making field-gates, or ash may be substituted for oak. The same remarks apply to wood for the gate posts, but oak is the best wood.

Stiles.—When a right of way exists across a farm, and the footpath passes by way of the ordinary field-gates, some annoyance and loss is caused by careless pedestrians leaving the gate unfastened. Some farmers, to avoid this nuisance, nail the gates up, drive stakes in firmly on each side, and on these place one or two platforms, forming steps whereby persons can climb over the gates. Where space can be allowed, it is best to provide a stile or wicket for foot traffic, by the side of the gate, and to fasten the gate by a substantial hasp and padlock. Stiles are a necessity where no gateway has been provided in the track of a footpath, and they are useful when placed in hedges at the bottom of hilly fields along by water-courses, for here they frequently prevent a hedge from being broken and trampled. A common form of stile is shown by Fig. 66, which represents one made of stout oak only. The posts should be 4 feet 6 inches in length, and cut out of a curved oak tree or bough of oak. Eighteen inches of the roughest and most crooked end of each bough should be left in the rough state, to be embedded beneath the soil, and this part should be pickled, tarred, or otherwise prepared as for gate posts. The top part must be squared to the form shown in sketch, thus making posts standing out of the ground 3 feet, each post having a section of 6 inches, or 6 inches by 5 inches. The posts must be socket-mortised to receive the ends of the rails, Fig. 67. The spacing should be as follows :

6 3 9 3 9 3 3

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The rails should be of sawn oak, 3 inches by $2\frac{1}{2}$ inches, and the tenons must be cut to the bevel of the posts, as shown in Fig. 67. The angle of this bevel will vary according to the intended spread of the stile, a useful spread being that which allows the tops of the posts to be 3 feet 6 inches apart, and the lowest rail 18 inches long. The length of the top rail before the tenon is cut will be 3 feet 6 inches, the second rail 2 feet 6 inches, and the bottom rail 1 foot 6 inches. The sockets should be cut to the depth of 3 inches, and amateurs will do well to place the posts in position at the desired angle, and cut the tenons of the rails to fit the mortises. These should be made to fit closely, and each rail secured in its place by wooden pins driven through post and tenon.

Stiles must be firmly fixed in their places, by excavating a pit for the feet of the posts, and ramming the loose soil down firm around the posts after they have been inserted in the pit. Some persons fix a stout platform of oak beneath the lowest rail, resting the edges of the platform on the shoulders of the posts, and nailing them thereto. This platform or step should project from 6 inches to 8 inches on each side of the lower rail, and should be cut out of not less than $1\frac{1}{2}$ inch oak plank.

I find that I must hold over a description of other forms of stiles and wickets to my next article, when I hope to also treat of garden gates, and small gates, to suit the fences already described.

(*To be continued.*)

LITHOGRAPHY FOR AMATEURS.

By H. E. GRANTHAM.

II.—MATERIALS, ETC. (*Continued.*)

IN the previous chapter I treated chiefly of those tools and appliances that the amateur cannot make for himself. In the present chapter I purpose speaking of those things that he can make at a very trifling cost, quite as good as those he can buy.

The "Scraper" is a tool used for removing specks, etc., from the stone when they occur among the work

where snakestone cannot conveniently or safely be used. The one I use is made of an old "three-cornered" file inserted into a convenient handle, and then ground down into a point, as in Fig. 1. Each *flat* side is ground, and the tool finally sharpened on an oil-stone. It works best on a wet stone.

Brushes for Etching are, I think, better than a sponge, which might get accidentally used for damping the stone, and so spoil the work. For etching the stone all over, I use a brush made by unlaying the strands of an old rope, tying it round, and then cutting the loose "oakum" into a convenient shape, something like a painter's brush. The part of the rope not untwisted serves as a handle. The brush should be about the size of a house-painter's brush used for ordinary flat work. A penny camel-hair brush with a proper handle serves very well for etching, corrections, and small places when the whole stone does not require to be etched.

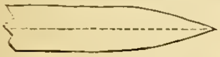


FIG. 1.—SHAPE SUITABLE FOR POINT OF SCRAPER.

Writing Transfer Paper is one of the most important things the amateur will need, yet it is so easily made, it is scarcely necessary to purchase any unless for the purpose of comparison. The paper is simply writing paper (of a medium thickness and finish), printing, or tracing paper, brushed over on one side with a solution composed of four parts by weight of starch, made rather thin, and one part of glue. Put the glue into soak for twelve or twenty-four hours, as necessary, and make the starch just before using the solution. Half an ounce of starch weighed before being mixed with the glue, will make enough to cover a fair number of sheets of paper. Make the starch with hot water pretty thin, add the glue, and stir well up, and use with a broad camel's-hair brush while warm. The starch makes the paper stick to the stone, but has scarcely enough body to bear the ink off the paper, so the glue is added to harden it. If the proportion of glue is too great, the paper will only transfer to a hot stone, and be more difficult to get off again after transferring. What is generally wanted is a paper suitable for both hot and cold transfers. The paper is improved by being "run through the press," face downwards on a hot stone, with a good pressure. This makes it smooth and shiny. Colouring matter may be added to the solution before applying it to the paper, to enable one side to be more readily distinguished from the other.

FIG. 2.—SIZE OF PIECE FROM TRANSFER INK.

The paper, as above made, is also used for pulling impressions from one stone to transfer to another, and thus enables the printer to have several copies of a subject on his stone, and only one drawing to work.

To Work a Transfer.—If it is a *fac simile* of the printer's own writing, say a circular, or something of that kind, first pin a piece of transfer paper to a board, and rule light pencil lines as a guide for the width of the lines. Now make the ink by cutting a piece off the writing transfer ink, obtained from the dealers, about the size shown in Fig. 2. Cut the tinsel off one end, and take a small tin patty pan, such as are used for baking tarts in, pour a drop or two of water into it, and hold it over the flame of a candle, lamp, or something that will make it warm; rub the stick of ink on it exactly as a cake of ordinary water colour is rubbed, until the bottom of the tin is covered with rather stiff ink. Add more water, keeping the tin warm, and stir with a brush or the finger tip until of the right consistency; which can only be learnt by experience. If it is too thick it will not run out of either brush or pen, if too thin it will spread, and very likely not transfer properly.

The ink being ready, take a clean pen (one ought to be kept exclusively for the purpose) and proceed to write the circular exactly as if writing with ordinary ink on common writing paper. Some difficulty will be encountered at first as the ink works somewhat differently to ordinary ink, having a greater tendency to spread, and the pen must be used with but little pressure, or it will scratch up the composition. Especial care must be taken not to touch the paper with fingers or hands anywhere near the work; *finger marks from a moist or greasy hand will roll up black*, for which reason always keep a piece of clean paper between the hands and the transfer paper. If a mistake should occur, or a blot, make no attempt to scratch it out. If it occurs early in the job, take a fresh piece of paper and start again; if later on, wait till the ink is dry, and then paste a bit of transfer paper over the place, using as little paste or gum as possible, and continue as if no mistake had occurred.

For very fine work, the brush is much to be preferred to the pen, as much better work can be done with it. It is, however, so delicate an instrument, that considerable patience is required as the extreme tip only is used, and it has to be "tempered" and brought to a point nearly every time a fresh supply of ink is taken. Straight lines are generally ruled with a ruling pen, and circles, or portions of circles, with the compass pen, both of which are easily used after a little practice. All designs of an elaborate nature ought to be first sketched on a piece of common or tracing paper, and then by the use of *red* transfer paper, a tracing in red is obtained on the transfer paper, and the work is proceeded with, using brush, pen, etc., etc., as required.

(To be continued.)

PHOTOGRAPHIC APPARATUS:

ITS PREPARATION AND CONSTRUCTION.

By J. POCOCK.

V.—INSTANTANEOUS SHUTTERS.

WITH the extra sensitive gelatine plates now manufactured, upon which the photographic image may be impressed in a small fraction of a second, a new and large field for work has been opened to part of the subject of the picture just as the lens was uncapped; and there are many other movable objects, such as waves, shipping, etc., which are also brought within the range of photography by means of these plates.

Under these circumstances, it now becomes the wish of most amateur photographers, so soon as they have made sufficient progress in their art, to try their hands at instantaneous photography; but before the desired end can be attained, something more than a

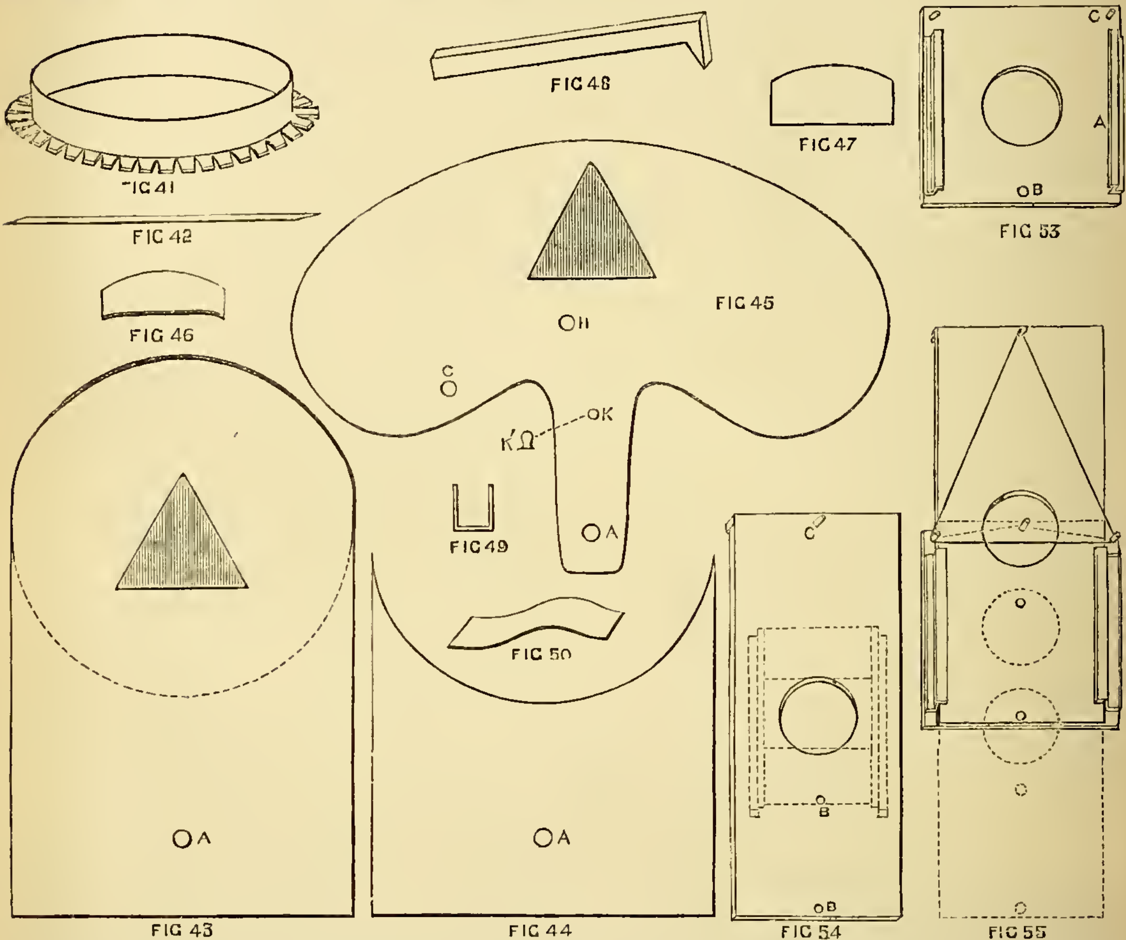


FIG. 41.—RING. FIG. 42.—STRIP FOR RING. FIG. 43.—BASE OF SPRING SHUTTER. FIG. 44.—MOVABLE PORTION OF BASE OF SPRING SHUTTER. FIG. 45.—MOVING SHUTTER. FIG. 46.—METAL ON TOP OF SPRING SHUTTER. FIG. 47.—PIECE ON TOP OF FIG. 46. FIG. 48.—TRIGGER. FIG. 49.—BEARING FOR TRIGGER. FIG. 50.—TRIGGER SPRING. FIG. 53.—BASE OF DROP SHUTTER. FIG. 54.—SHUTTER FOR DROP-SHUTTER. FIG. 55.—DROP-SHUTTER, COMPLETE. FIGS. 43, 44, & 45 ARE FULL SIZE.

the photographer, both amateur and professional. Pictures may now be obtained of living subjects in the animal world without any of those vexations which formerly arose before the introduction of these plates, through the difficulty of persuading one animal, let alone more than one, to stand perfectly still for the time then necessary to take a photograph, not to mention the irritating effect of a movement on the quick plate is necessary, and that is, a good and reliable instantaneous shutter, and in this paper I purpose describing two forms of this very desirable bit of photographic apparatus.

The first shutter, now to be described, may be made of almost any metal that is at hand, for either tin, copper, brass, or zinc will do; of these, however, brass is the best, though the one made by the writer

for his own use, being wanted in a hurry, was made of zinc, that metal being more easily and quickly worked.

Well, we will suppose that the metal has been selected; the next thing is to decide what thickness shall be used, and this will depend upon the size of the shutter, which again depends upon the outside diameter of the lens shade, with which the shutter is to be used. The drawings (Figs. 43, 44, 45, 51, and 52) are full-sized, and are those of a shutter for a lens having a sun shade of about $1\frac{1}{2}$ inch diameter, and the thickness of the metal for the part represented by Fig. 45 should be such that the piece will be stiff, too rigid to be easily bent, while the other parts may be made of metal about half the thickness of that chosen for Fig. 45.

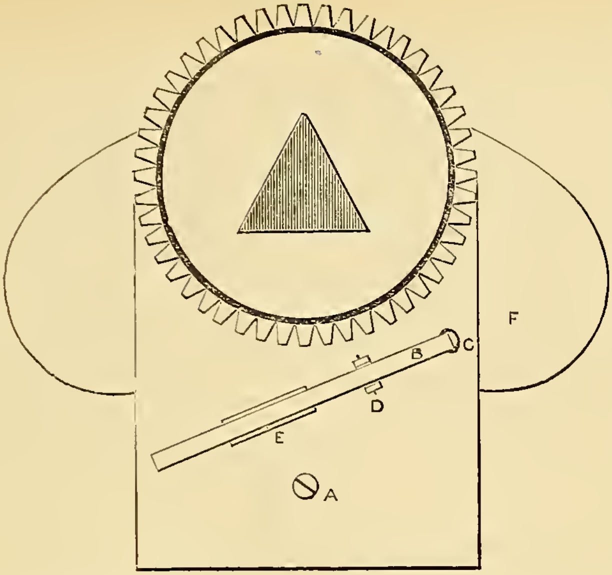


FIG. 51.—BACK VIEW OF SHUTTER WHEN COMPLETED.—FULL SIZE.

Now to commence the manufacture of the shutter; a piece of metal $\frac{1}{2}$ inch broad for the size given in the drawing, but broader for large and heavy shutters, and of a length sufficient for the ends to overlap $\frac{1}{4}$ of an inch when it is bent round the shade of the lens, must be cut out, and while it is still flat, a line should be drawn down the middle, and the ends chamfered off on opposite sides for $\frac{1}{4}$ of an inch. as in Fig. 42. This piece is then to be bent round the shade of the lens, and temporarily secured by wire or other means, so as to fit well and evenly all round, and the ends are to be soldered together. The ring thus formed is then to be taken off the lens shade, and a series of cuts made from the edge down to the line previously marked. These cuts should not be more than $\frac{1}{4}$ of an inch apart, and if the metal chosen is zinc, they may easily be made with a good strong pair of scissors. The cut pieces are then turned outwards to form a flange, by which to solder the ring on to the base of the shutter (Fig. 43), and we have the ring complete, as in Fig. 41.

The base of the shutter is the next thing which must receive our attention. It consists of a piece of metal cut out in the shape shown by Fig. 43, a triangular opening being cut in it as represented by the shaded portion in the figure; this last may be done with a cold chisel, the opening being finished off with a file. The ring must then be soldered to the base in such a manner that the triangular opening in the latter comes just in the centre of the former; and another piece, shown separately by Fig. 44, is then to be soldered on under the ring. This will bring the surface level with the flange of the latter, and will give the shutter a much neater appearance, besides adding considerably to its strength and rigidity. A small hole must be drilled in the position shown at A, in Figs. 43 and 44, for the bolt upon which the movable part works to pass through, and this part may then be laid aside for the present. The dotted line in Fig. 43 shows the place where the pieces shown in Figs. 41 and 44 join.

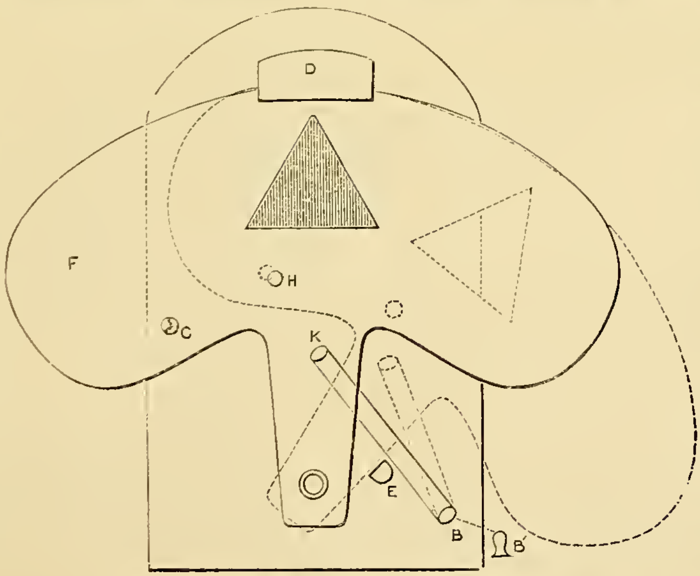


FIG. 52.—FRONT VIEW OF SHUTTER WHEN COMPLETED.—FULL SIZE.

Fig. 45 is the movable portion of the shutter, and it is advisable to first cut out this piece in cardboard, so as to get the best shape and proportions before cutting it out in metal. This movable part, of course, constitutes the actual "shutter," and an opening must be cut in it of the same shape and size as that in Fig. 43, and in such a position that when these two pieces (Figs. 43 and 45) are pivoted together by a small bolt through A, the two triangular openings will exactly correspond. A small pillar, K′, $\frac{1}{8}$ of an inch high, filed out of stout brass wire, is to be soldered on at K, and the piece may then be placed in position upon the base, a piece of wire being passed through the two pieces at A as a temporary pivot. When the shutter is quite finished, this piece of wire may be replaced by a rivet, or, more conveniently, by a small bolt with two nuts, the second to act as a lock nut.

A piece of metal (Fig. 46) of the same thickness as that of which the movable shutter is made, must now be soldered on at the top of Fig. 43, so that the shutter will just clear it when swung from side to side upon its pivot, and another piece (Fig. 47) is to be soldered over this, so as to overlap the top of the shutter, and keep it in place while yet allowing it to move freely from side to side, as shown at D, in Fig. 52.

Fig. 48 is the trigger. This is best filed up from a stout piece of cast brass, such as an old clock-plate; but it may, of course, also be made of stout brass wire.

Fig. 49 is a strip of brass, turned up as shown, to form a bearing for the trigger, and a small hole is drilled through each side of this piece and through the trigger, and the latter secured in its place by means of a small rivet. Fig. 50 is the trigger-spring, formed from a piece of good stiff clock spring, bent to the shape shown, and then tempered.

Fig. 51 shows the shutter as seen from the back when finished and set for focussing. A is the pivot; B, trigger; D, bearing, soldered to base; E, the trigger spring; this last may be either riveted or soldered to the base, but in the latter case, care must be taken, or the temper of the spring will be destroyed; C is a small hole through which the point of the trigger works to engage other holes made in the movable piece, F. Fig. 52 is the front view of shutter, which is now finished, with the exception of the two holes, C and H, which must be made in their proper places in the movable part, C being made in such a position that when the point of the trigger engages it from the back, the triangular openings in the shutter and base will coincide, this is for the purpose of focussing the picture; and H must be made so that the point of the trigger will engage it when the shutter is pulled so far over to the right that the opening is entirely closed. A small pillar, B′, is then to be soldered to the base at B, and a small elastic band (two bands if a very quick exposure is required) must be stretched over the pillars, K, B, and a small piece of metal soldered to base at E, to act as stop, and our shutter is ready for use.

The exposure is effected by pulling F over to the right until the trigger point engages the hole, H, when the dark slide shutter is drawn out, and the trigger being pressed, its point is raised, thus setting free the piece, F, the latter being pulled across to the left by the elastic band. The dotted line shows the position of the shutter *after* exposure.

I will now describe the shutter, usually known as the "drop shutter." This is easier to make, but not quite so portable as the one already described.

The ring by which the shutter is fixed to the lens may be made as shown in Fig. 41, and the remainder may also be constructed of metal, or of mahogany, or the body may be made of mahogany, and the shutter itself of ebonite. I shall not give any dimensions for this shutter, as every reader will be able, without the least difficulty, to decide upon those best suited to the lens with which he intends to use it; the diameter, length of focus, and rapidity of the lens itself, having moreover to be taken into consideration.

Fig. 53 is a front view of the base of the shutter. If this is made of wood, the ring (Fig. 41) should be soldered to a circle of metal, which may then be screwed on to the back of Fig. 53. In front, down each side, two pieces, A,A, of the material used are soldered or screwed, one on top of the other; the piece next to the base should be the least shade thicker than the shutter itself, and the outer piece should be $\frac{1}{4}$ of an inch wider than the other, so that it will overlap and form a groove for the shutter to slide in.

All parts of the apparatus should be made as thin as is consistent with strength, for the sake of lightness. The hole for the trigger is shown at B, Fig. 53. Small pillars are added, as shown at C, C, to take an elastic band when it is desirable to increase velocity of the shutter. Fig. 54 shows the shutter itself; B, B, are the trigger holes; and C, the pillar for elastic band.

Two grooves may also be formed on the shutter itself, and two small shutters made to slide in them, as shown by the dotted lines, and by this means the size of the aperture and consequent time of exposure may be still further regulated. This, however, is a refinement scarcely necessary in ordinary practice. A narrow strip should be fastened at the top of the shutter at the back to act as a stop.

The construction of the trigger and spring, and the manner of fixing them to the back of the base are exactly the same as in the case of the apparatus first described. Fig. 55 shows shutter set ready for the exposure, with accelerating elastic band in use; the dotted lines show position of shutter *after* exposure.

(*To be continued.*)

PRACTICAL LESSONS IN WOOD CARVING.

By E. ARTHUR EDWARDS.

V.—FRETTED LETTER-RACK—PHOTO FRAME.

A CHANGE from the drudgery of much "cutting down" will, I think, be welcome to many; for that process, easy and interesting as it doubtless is to the practised hand, is nearly equivalent to the dear old five-finger piano exercises of our early youth. But the result of diligent hard work will be found to be as satisfactory in the one case as by this time it has proved to be in the other; and before leaving that branch of the study of carving for awhile, I must again insist, in the strongest manner possible, upon the great importance of most careful and deliberate work in the "cutting down," as it will assuredly make or mar the whole thing. However, we need not trouble about it in the subject under immediate notice, as the groundwork is fretted away altogether, and (as in ordinary fretwork) the design is so contrived that the various parts interlace sufficiently to rigidity. It will be seen that I have departed somewhat from the beaten track of designers of letter-racks, and I am certainly inclined to think that this particular rack has advantages not possessed by others; at any rate, it is eminently useful, and if well carved, should be also a thing of more or less beauty. The wood chosen should be strong and close-grained (a nice bit of walnut, for instance), $\frac{5}{8}$ inch thick, and the grain should run across the pattern; saw round the outline, and cut out all the spaces usually devoted to groundwork, including the triangular pieces at the top and bottom; then with a machine drill (if handy) bore two very small holes through the outer and inner stalk at O, P (Fig. 14), and insert French wire nails or pins to fit them *tightly*; this must be a neat job, as the success of the whole thing turns upon the hinge thus made. Now the *dotted* line should be fretted round, resulting in the complete freeing of the whole block of enclosed leaves which will come away in one piece, thereby giving greater freedom of action for carving. Next, cut a piece of backing $\frac{1}{4}$ inch thick, or less (light-coloured wood if procurable), the same shape as the outer stalk, but $\frac{1}{4}$ inch less in diameter all round, and cut away a trough (with 2 or 3 G,) at the position to be afterwards occupied by the lower extremity of the inner stalk—that is to say, a broad line between the points O and P. It will now be seen that when the letter-rack is suspended, the block will tilt forward about $1\frac{1}{2}$ inch, sufficiently wide to hold a fair amount of unconsidered trifles in the shape of bills, circulars, etc., and the backing must not be fixed until by a little ingenuity this result has been attained. When it has been pronounced a success, the carving may be commenced. The process to be followed in this part of the work is, of course, precisely similar to that already described, though with broad sycamore leaves, such as those here given, the undulations should be larger, and more free in scope and character; the primary depressions should be scooped out with larger gouges, and should then be cut up into smaller ones, such as would be altogether lost in ivy leaves. A good impression is gained by alternately raising and depressing the sharp extremities that are found in the outline of the leaves. The amount of veining necessary is indicated in the sketch. All the stalks should be made *nearly* round by undercutting, except in the neighbourhood of the dotted line, where they should be only slightly convex.

FIG. 15.—OUTLINE SKETCH OF FRETTED LETTER-RACK IN OAK LEAVES.

It is most imperative in carved fretwork that the undercutting be most carefully and completely attended to, and in such a design as this the sharp points should be cut down to a very thin edge (by turning the wood upside down). The outer stalk might have its backing fixed temporarily during the carving process, to prevent breakages, or permanently, if there is no doubt as to the inner block working properly on its hinges.

My idea is to have, say, four of these racks, identical in general design, but varying in detail, and I have therefore given an outline sketch (Fig. 15) of a second one in oak leaves, showing the dotted line as previously described, and the positions of the hinges.

In this sketch—because it is in outline, and therefore clear of the shading which it was necessary to introduce in Fig. 14 in order to show the general contour of the carving of the surface, and the undulations of the leaves—it has been possible to show the line of demarcation between that part of the rack which is to fall forward, and the frame-like portion which is to be fixed to the backing far more clearly, and to indicate also in position at O, P, the nails or pins on which the prominent portion turns, and by which it is secured to the framing from which it has been detached. This is one of the great advantages offered by outline sketches, although it is not possible to show in them the *tout ensemble* of the carving when complete, which can only be expressed by strong contrasts of light and shade, and a variety of middle tints. In Figs. 14 and 15 I have represented oak leaves and sycamore leaves. With these vine leaves and maple would complete a very pretty quartette. A few words will suffice, in conclusion, to dispose of the oak leaves; a narrow trench should be cut down in the direction of the main vein, varying in depth, but as a rule running the entire length of the leaf; the sinuate margin affords plenty of scope for effective treatment, and the broader segments may be alternately raised and depressed with very little trouble; they should be nicely rounded off towards the edge, and the undercutting should leave nothing of their actual thickness visible: the veins should run almost to the extremity of each segment.

FIG. 14.—DESIGN FOR FRETTED LETTER RACK IN SYCAMORE LEAVES.

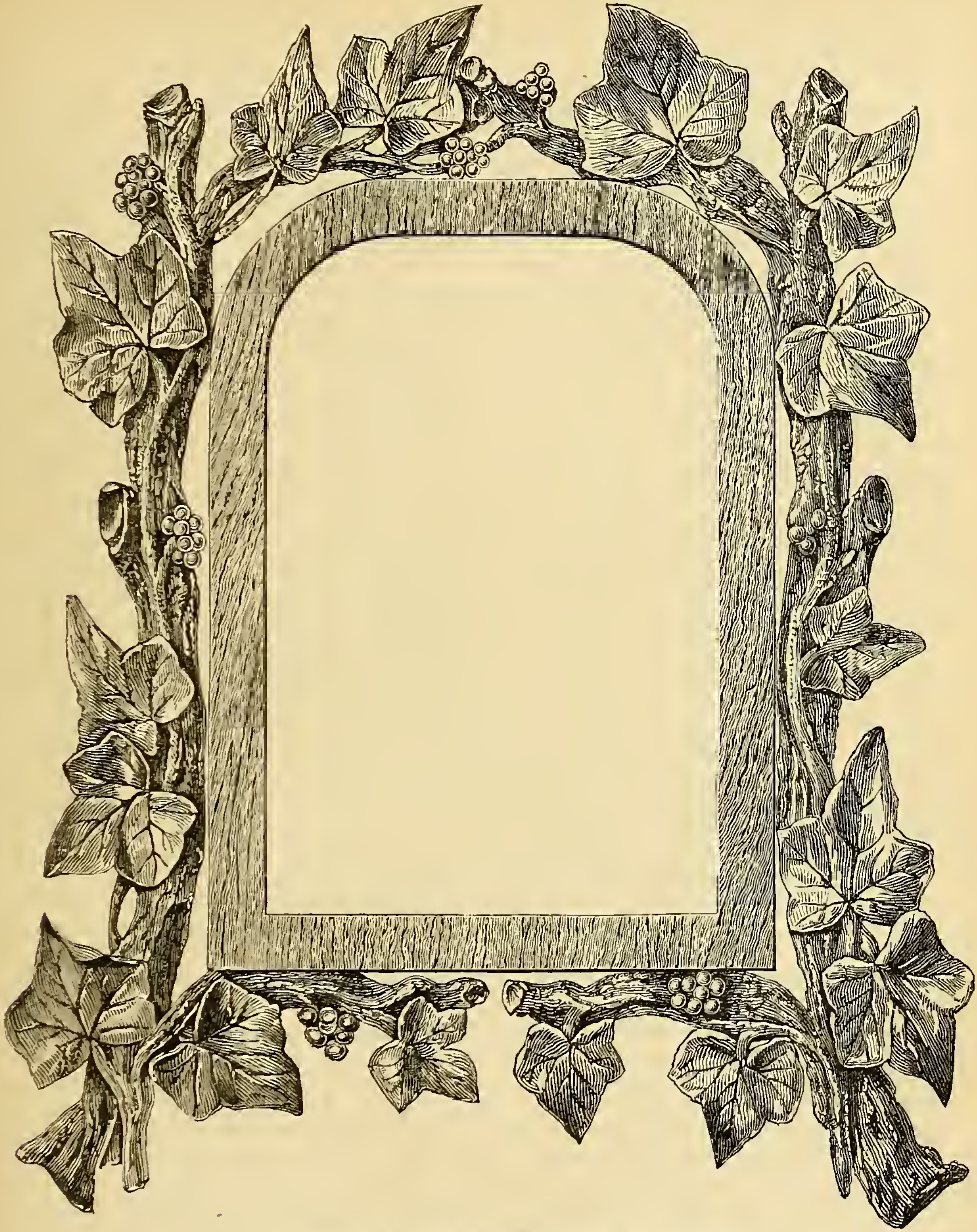


FIG. 16.—DESIGN FOR FRAME FOR PHOTOGRAPH IN IVY LEAVES.

It was my intention that Fig. 15, which presents a design for a fretted letter-rack in oak leaves, should have been given in three-quarter size, that is to say, $4\frac{5}{8}$ in. by $3\frac{7}{12}$ in., taking the extreme length and the extreme breadth of the design. I had written "three-quarter size" under it, and the artist unfortunately took this as a direction for his guidance, and produced the engraving in the size in which it is presented to the reader, namely, $3\frac{1}{2}$ in. by $2\frac{2}{3}$ in., or very nearly so. Thus the drawing is $\frac{3}{4}$ of $\frac{3}{4}$ size, speaking precisely, or $\frac{9}{16}$ size, which is a little more than half-size. Having explained this, no one need be at a loss to make a

full-sized drawing, either by aid of the pantagraph, or by enlargement by proportional squares. In fact, as all my illustrations are given in due proportion as to length and breadth, anyone may enlarge or reduce them in accordance with his special requirements. A knowledge of, and a little occasional practice in, both methods is desirable, but for perfect accuracy of outline, combined with absolute fidelity to the proportions of the original sketch, there is nothing to beat the pantagraph, a mechanical means of reproducing drawings of the same size as the original, or on any scale, which no wood-worker should be without. The instrument is especially useful to those who cannot draw, for when once the principle of the adjustment of the framework of which it consists is perfectly understood, it only requires patience and a steady hand to work with it.

Photo Frame.—Lest the letter-rack be considered too troublesome at a first attempt at carved fretwork, I have given a simple little frame (Fig. 16), cabinet size, against which this complaint cannot be made : it is all in one piece (except the backing and rest), and looks remarkably pretty when nicely carved. A piece of oak, unpolished, looks as well as anything, and will make a contrast to the darker woods hitherto used. It should be quite $\frac{3}{8}$ inch thick, and the grain should run across the pattern as usual. Fret round the outline, and cut away the centre and other spaces not devoted to pattern, and then before the carving is commenced cut the rabbet for glass and picture : this is easily accomplished with the largest chisel, in fact, the whole of the *modus operandi* is so simple, that description seems almost unnecessary. The frame itself is greatly improved by being slightly bevelled towards its inner edge, care being taken to avoid cutting through the rabbet. It will be observed that the ivy tendril appears to creep up and cling to the supporting branches : this then should be made to stand out quite distinct from the stem. The leaves carved in the ordinary way, some pointing upwards and some downwards, must be very well undercut as a finishing stroke, and the directions hitherto given for stalk-carving will show up with very good effect if carefully carried out.

I must refer briefly in conclusion to the slightly misleading effect of the drawing in Fig. 12, page 192. I had not intended that the thickness of the leaves should be shown at all—in fact, the undercutting process is intended to avoid that eyesore altogether, and the stamping should be carried quite underneath the leaves, so as to throw them up as much as possible. I can only suppose that my sketch was not as clear on this point as it might have been, and that this led the engraver into error.

(*To be continued.*)

FISHING TACKLE :

ITS MATERIALS AND MANUFACTURE.

By J. HARRINGTON KEENE.

VI.—WOODS USED IN ROD MAKING—STEEL CENTRED FLY-ROD—FORMS OF ORDINARY RODS.

"NOTHING is new but that which is forgotten," is a saying attributed to Talleyrand, and full of wisdom. It applies to fishing as to many other arts, and, therefore, when I tell my readers that the Ninevites—as evidenced by their bas reliefs—used a rod in the capture of fish, they need not regard the news as a matter for surprise. As I shall show in a subsequent paper, the Macedonians employed artificial flies, and the gorge hooks which Nobbes immortalized in his "Art of Trolling" (1682) were referred to by Oppian, and found amongst the ruins of Pompeii. For aught we know, the angle rod may even have been used on the banks of the four rivers, watering the paradise of the "grand old gardener," Adam ! The point is, however, of no importance, and the past history of the fishing-rod may be dismissed by briefly saying that its complete efficiency dates from about a hundred years ago. Improvements in detail have arisen abundantly, but the principles governing rod-making are practically unalterable, and once having been recognized must perforce guide every subsequent production. I have a fly-rod in my possession at this moment which has probably killed tons of fish—for it is over a century old ; and yet its taper and general appearance is totally unimpaired, and the entire *tout ensemble* is quite comparable with some of the more costly finished weapons of this superlative age.

The wealthy angler delights in many rods of varied patterns. He has his rod for trout fly fishing in rivers, and a different one for the same named fish in lakes ; then there is one for trout trolling, and another for "nonning ;" different ones for the salmon, pike, perch, barbel, chub, dace, and the other fish of that order—even the little gudgeon must have a special weapon. There is no reason why the angling Crœsus shouldn't spend his money in this way, but I apprehend that the readers of these articles are not inclined to so indulge themselves ; and I purpose, therefore, to give a brief notice of certain typical rods, and to simply and tersely explain the *modus operandi* of rod-making and mending, to the end that anyone with ingenuity, and a certain amount of handiness in his composition, may construct his own "wands," and do his own repairing to his satisfaction. Of course, I must assume a little knowledge of the use of tools employed in woodwork.

Before the industry of professional tackle-making

had existence—for as I have premised the tackle manufactories of to-day, are distinctly of modern growth—the angler was *obliged* to construct his own tackle ere he could catch "fysshe." The sturdy ashen pole, thick as an "arme grete" (*i.e.*, thick as your arm) bound with "hopis of yren" (hoops of iron) for ferrules described by the first English author on fishing, is completely out of fashion, and the dainty split cane, eight ounce rod looks like a veritable fairy wand in comparison with this formidable weapon figured in the "Boke of St. Albans." At this time, deftness of mechanical skill, the discovery of better materials, and the recognition of the necessity of increased lightness and skill in angling have separately and together induced the productions which, in many cases, seem absolutely perfect and susceptible of no improvement. I shall give descriptions and illustrations of what a long experience has convinced me to be the best styles only of rods and their fittings.

First.—A few words as to the materials from which modern rods are made. Of our native woods, ash, yew (for short butts). lance, red deal, hazel, withy—and for butts even chestnut and oak are utilised as occasion requires, though each and all are to a great extent superseded by foreign material to be hereafter mentioned. Ash is still a capital wood for the thicker joints, and lance and red deal are invariably used for the manufacture of the very beautiful so-called Nottingham rods which are at once so cheap and durable. The other woods are, however, incurably out of fashion, owing to importations of better and more suitable material.

The names of the chief of the various foreign woods used in rod-making will probably convey but little idea of their relative or positive value, but I give them because a treatise on rod-making would be incomplete without them. They are hickory, washaba, greenheart, blue mahoo, snakewood, and red locust; and of the hollow woods, East India cane, bamboo, Carolina white, and jungle cane, are those most in request.

Of these the most in favour by those rod-makers, who are themselves practical anglers, are hickory, greenheart and the canes. Hickory used to be very much in favour, but as compared with greenheart it is found to warp unduly after contact with water, and is, therefore, now chiefly used for butts, in such rods where its weight is of value in contributing to the proper "balance"—a term to be explained further on.

Hickory is a Canadian wood, and is sent to us in "billets"—that is, I need scarcely explain in V-shaped longitudinal sections of the log. On their arrival in this country, these billets are commonly cut into thickish planks, which are properly seasoned by being packed away some considerable period, before being used. Of course, the largest and best makers have it in their power to buy the best stuff, and this involves the giving the best price—a truism. I should not trouble to repeat, were it not so often forgotten—hence their comparatively high prices for the manufactured article. The rejected residue is disposed of to smaller makers, and these people are enabled to produce at a cheaper figure.

Greenheart grows in the West Indies, and is very much used—indeed, I go so far as to pronounce it the very best all round material for all the joints *except* the butt of fishing-rods of whatsoever description. A stiffer wood is probably better in combination for the butt. Greenheart is very elastic, and may be drawn out to exceeding fineness without becoming brittle. This wood has a nasty habit of warping as it seasons, but a little manipulation over a spirit lamp, and subsequent suspension with heavy weights attached, generally rectifies the fault. Let me, however, impress one weighty piece of counsel on the amateur—never buy a *cross-grained* piece of greenheart, for as sure as fate it will "go" sooner or later, perhaps when the user is fast into a good fish—at which juncture it is very probable that the recording angel will be busy.

Of the hollow woods, the bamboo of the East Indies is very serviceable. Its natural length is often quite 20 feet, and its tenacity of fibre makes it a favourite for roach and spinning rods. The Carolina cane is usually employed for butts. The jungle canes are of Asian growth, and are chiefly utilised for the glued up split cane rods which are so popular—rather undeservedly, I think. The beautifully mottled appearance of a well-finished cane rod is produced by staining the wood with aqua fortis and nut galls. The stain is burned in immediately it is put on. The rods are then rubbed with sand-paper, and highly polished—a dozen coats of varnish being not unusual in some cases. Of this subject more, however, later on.

Though wood is for all ordinary purposes the best material, it occurred to that most accomplished angler, David Foster, of Ashbourne, that a union of steel and wood "would, if arranged correctly in right proportions, be an advance in a desirable direction." This idea was reduced to a practical result, and the "steel centred fly-rod" is an accomplished fact, and protected by Her Majesty's letters patent by the sons (Messrs. D. and W. H. Foster) of the "amiable angler of Dovedale." Their claim for its excellence is thus forcibly put: "In this recent development in solid wooded rods the inventor's aim has been, first, *strength and durability*; second, *pliancy and lightness*; and, lastly, the consequent *reduction of length and condensation of power*. That these objects have been obtained . . . . there is ample testimony

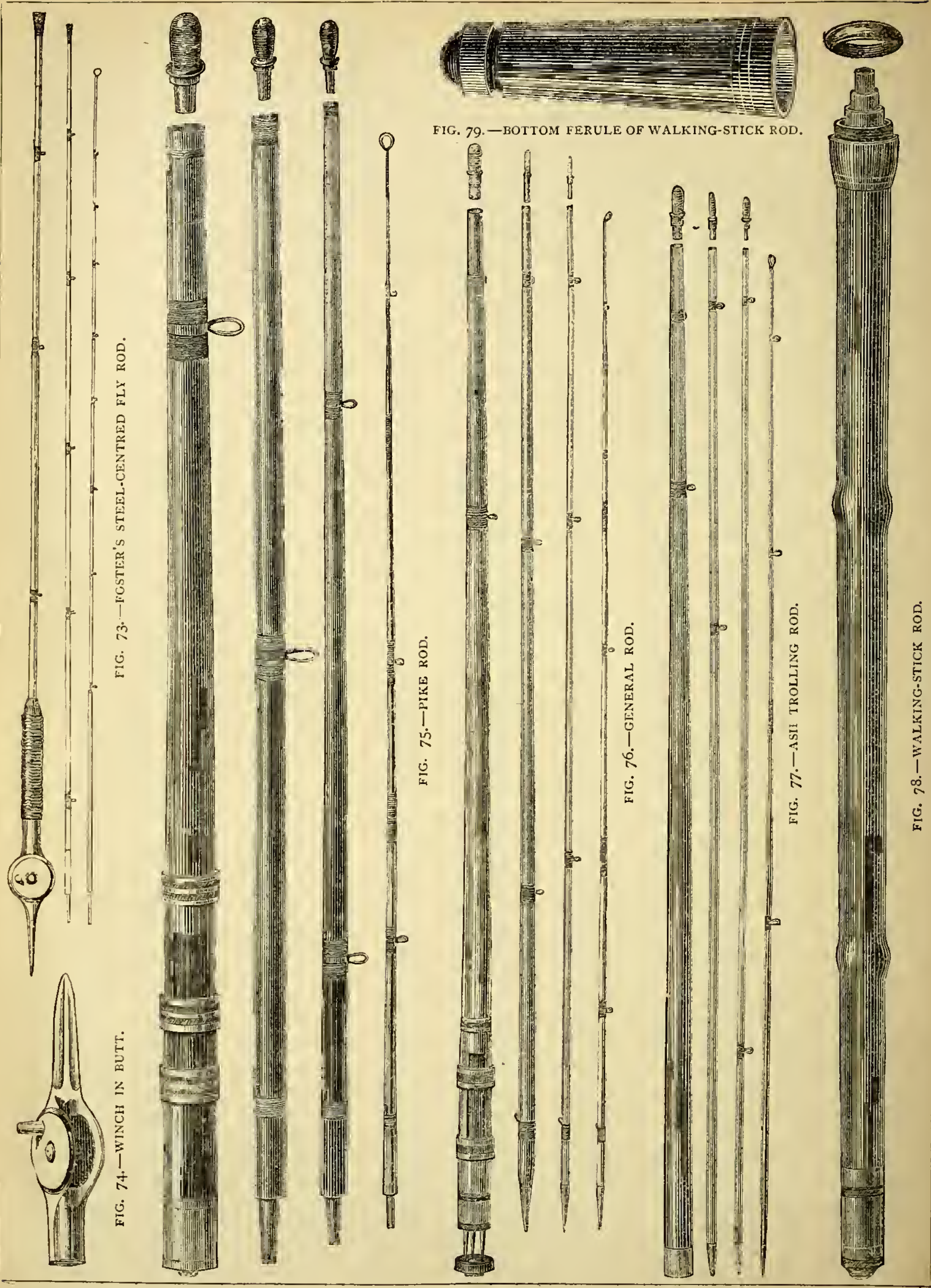


FIG. 73.—FOSTER'S STEEL-CENTRED FLY ROD.

FIG. 74.—WINCH IN BUTT.

FIG. 75.—PIKE ROD.

FIG. 76.—GENERAL ROD.

FIG. 77.—ASH TROLLING ROD.

FIG. 78.—WALKING-STICK ROD.

FIG. 79.—BOTTOM FERULE OF WALKING-STICK ROD.

. . . . continually accumulating from habitual users. The presence of the steel core in the *butt only*, serves to strengthen a ten or eleven foot rod, so as to render it capable of casting an equal distance with an all-wood tool having 18 inches the advantage in length, whilst lightness and precision in the out-put of line is more marked in the case of the former. With two joints out of a total of three steeled, these advantages are the more manifest. The spring derived from the presence of the metal core has an effect difficult, verbally, to describe—such are the working results of the backbone thus instilled. The easing nature upon the hand and arm incurred by its use is so significant, that anything short of a practical test can only impart an imperfect impression of its appreciable qualities. Wrist action only is all that is called into play in the delivery of an average out-put of line, and by this motion the perfect swing of the implement pays forward the length equally with ease and precision."

There is also another advantage in the build of this rod. The reel is made inside the butt, so to speak, and thus all the nuisance of the line entwining round the reel is entirely avoided. Figs. 73 and 74 represent the rod in its entirety, and the detachable winch in the butts.

That the tyro in rod-making may have a good general idea of the build of ordinary rods, I give several diagrams of rods in a complete form. Fig. 75 shows a four-joint pike rod, the separate parts of which I shall presently show. Fig. 76 exhibits a general rod suitable for several purposes, such as pike, perch, and barbel fishing with the "ledger." Fig. 77 is an ordinary and most easily made ash trolling weapon, quite suitable for gorge or line bait-fishing; whilst Fig. 78 shows a walking-stick rod made throughout of bamboo, and suitable for roach or other light fish. A is a terminating ferrule, an enlargement of which is shown by Fig. 79.

I think I may safely aver that the cuts give a fair idea of the rods within the power of the amateur worker to make, and after the reader has carefully noted them, it becomes opportune to go on to a consideration of the next part of our subject, namely, "Rod-making and Repairing." I have noticed that many correspondents have expressed a wish from time to time for instructions in the art of making new rods and repairing broken joints and other damage, and I will endeavour to satisfy them to the best of my power. In my opinion every fisherman ought at least to be able to mend his rods as well as to make his own tackle, for he will often find himself in a position in which he can get no aid from professional rod-makers, and must perforce fall back on his own resources. (*To be continued.*)

HELP FOR STRUGGLING AMATEURS.

By PITCHPINE.

V.—The Stock and Bits—What to Buy—How to Sharpen Bits of all kinds—How to do without a Plough—Conclusion.

A STOCK and set of bits is one of the most useful tools that an amateur can add to his list, and may now be bought at a very low price. One of Barber's patent braces, about the best kind one can possibly have, may be purchased new for 3s. 2d. The special advantage of these braces consists in the chuck for holding the bits, which replaces the old socket and thumbscrew, or socket and spring catch. It will hold almost any bit firmly and true, without the necessity of previously fitting the shank of the bit. If, however, this is too high a figure, a common 8 inch socket brace, with thumbscrew, can be bought, in these times, of any ironmonger either in town or country, for the very moderate sum of 1s. They also supply Barber's patent brace, previously mentioned. You had better get the bits as necessity arises. They are sold in three different qualities, black, bright, and straw-coloured; the only difference that I could ever perceive—and I have noticed them somewhat closely—being that the bright ones are higher in price than the black, and also more liable to rust, while the straw-coloured ones are more expensive than either. Some workmen say that the last named are better and more carefully tempered. I have never found this to be the case, however, in my own experience, and should say, get black ones, the price being from 3d. to 6d. each.

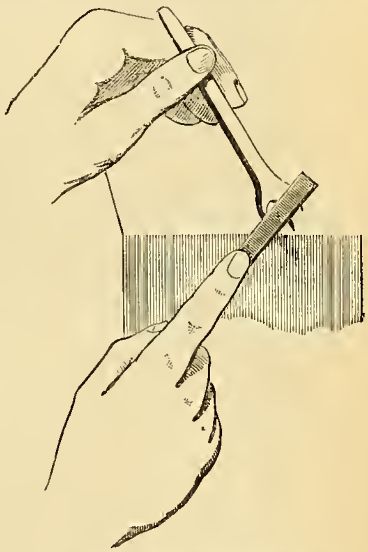


FIG. 9.—MODE OF SHARPENING BIT WITH FILE.

A full set of bits consists of thirty-six, but do not be alarmed. You can manage very well indeed, if you get one-third of this number, and these are what I should recommend: Nose bits, $\frac{1}{8}$ inch, $\frac{1}{4}$ inch, $\frac{3}{8}$ inch;

centre bits, $\frac{1}{2}$ inch, $\frac{5}{8}$ inch, $\frac{3}{4}$ inch, $\frac{7}{8}$ inch, 1 inch; one countersink, one screwdriver bit; and in addition to these get two or three twist bits, Jennings' pattern, when you can afford them; they are, however, rather expensive. Of course, you need not buy all these at once, but make a point of getting them as soon as you can, for they are often in request.

I suppose a bit is about the last thing that the average amateur thinks of sharpening. He has no particular objection to give an edge to this kind of tool, beyond the general and peculiar objection that most amateurs entertain to sharpening any kind of tool, but it never appears to strike him that a bit can need sharpening. If you will excuse a vile parody, "Plane irons notch, and chisels blunt, but bits bore on for ever," is the usual idea, yet you can no more do good work with a blunt bit than you can with a blunt chisel or plane iron.

It is no more difficult to put an edge on a brace bit than on any ordinary edge tool if you know how; but if you don't go the right way to work, it is just as easy to spoil one as the other. In all cases when you are learning to sharpen a tool of any kind, think first of all of the class of work the tool is intended for, decide in your own mind exactly what you have to do, and then attempt to do it with as little bungling as possible. To begin sharpening a tool aimlessly, and without knowing just the sort of edge you want to produce, is to court failure.

The work that the centre bit has to do is to first of all cut the fibres of the wood in a circle equal in diameter to that of the bit. This is done by the point A, Fig. 7, which should be chisel-shaped, and knife-like in its action. This point should not be filed unless absolutely necessary, as it would wear it away too rapidly, and leave it as at A, Fig. 8, where it is shorter than the point C, and therefore quite useless for the work required of it, viz., to divide the fibres of wood before the part C cuts them out. To keep it in order it is generally sufficient to rub it occasionally with an oil slip. To sharpen the bent cutter C, use a flat file lightly, as in Fig. 9, and afterwards rub with the oil slip. This edge is also chisel-shaped, and should be flat on the under side, the bevel being on the top face. Nose and shell bits are sharpened on the inside of the edge, for it is evident that if sharpened on the outer edge, the bit would be filed away from the circumference of the hole, and would not cut at all. I have gone thus far into the matter of sharpening bits because, in the first place, it is too often neglected by amateurs; and in the second, I don't remember to have seen it spoken of in any work on amateur carpentering. The subject of sharpening tools in general opens up too wide a field for these papers, but I can give you one hint. Get a carpenter to let you see him sharpen one or two edge tools, and to put you in the way of doing it. This will be better than volumes of written instruction. One of the first things you have to do is to learn to sharpen your tools properly; until you can do this, there is not much chance of your doing anything else, for even an experienced hand cannot work with blunt tools, so what chance do you stand? An experienced hand never tries to work with blunt tools; he knows better. An inexperienced amateur often does try, because he does not know better; or if he knows, thinks it does not matter. However, he soon finds out.

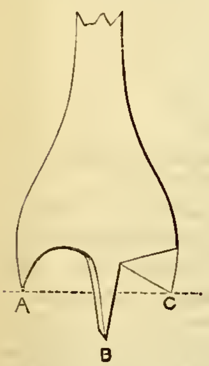


FIG. 7.—BIT IN PROPER FORM AND CONDITION.

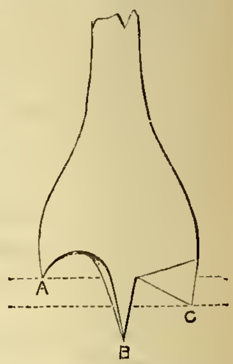


FIG. 8.—BIT WITH CUTTING PART FILED AWAY.

By the time you have learned to use the tools already mentioned, you will not require any advice as to what others to get; the nature of your work and the length of your purse will decide the question for you, but if you cannot afford to buy any tool you require for some particular job, don't be discouraged and give up trying. You can always scheme to do without it, and I can assure you there is a great amount of satisfaction to be derived from being thus independent. To illustrate what I mean, suppose you are making drawers. To do the work properly, you need a plough to cut the grooves in front and sides, into which the bottom is to slide. A plough is an expensive tool, costing not less than 12s. new or about 8s. secondhand, so you think of some other way of putting the bottoms into your drawers. Instead of a groove, cut a rebate along the bottom of the sides and front, and when put together, turn the drawer bottom upwards, drop the bottom into the recess formed by the rebates, and fasten a thin slip of wood all round to keep it in place. The result is nearly equal to the correct method; and whenever you get in a fix of this kind, remember that there is always a way out of it if you can only find it out.

In bringing these short papers to a close, let me give you one bit of advice that contains the keynote to success in most things, but particularly in the present instance. It is this: "Whatsoever thy hand findeth to do, do it with all thy might."

MY FURNITURE, AND HOW I MADE IT.

By MARK MALLET.

III.—MY PEDESTAL FOR THE BEDSIDE—MY HANDY TABLE FOR THE BEDROOM.

ALTHOUGH before we have done with bedroom furniture we must venture on weighty matters, such as a wardrobe and a chest of drawers, we will in the present paper content ourselves with lighter articles; and, first, we will engage upon—

My Pedestal Cupboard for the Bedside.—In Fig. 19 we have the front elevation of such a cupboard. It stands 2 feet 6 inches high, is 16½ inches in its greatest width, and 12¼ inches in its greatest depth. We shall find it so simple that to give working drawings on a larger scale would be an unnecessary waste of space: the diagrams given are one inch to the foot.

First required for its construction will be two pieces of inch board to form the sides—their dimensions will be 2 feet 6 inches by 11 inches. In Fig. 20 we have one of these sides, as seen from within, together with such other parts of the structure as come in contact with it. From this we shall see the form to which the board has to be cut.

At its front edge 3 inches have to be marked off from the top and 5 inches from the bottom, and between these marks the edge of the board has to be cut away to the depth of one inch. This space will be to receive the door, A. Three ledgers, B, C, and D, have then to be screwed to the side, the lowest, D, with its upper surface 4 inches from the bottom—this is to carry the floor of the cupboard; the middle one, C, with its upper surface 15 inches from the bottom—this is to carry the shelf; and the upper, B, with its upper surface one inch from the top of the side—this is to carry the top of the cupboard. These ledgers are three-quarter inch thick and an inch wide; the middle one will be 10 inches, the others 11 inches long. The lower projecting corner of the ledgers, B and C, should be neatly bevelled off; D should be left square.

The top and bottom, E and G, are made of inch board; they measure 13 inches by 11 inches, and are to be fixed in place by screws passing through the sides, as well as by others driven into the ledgers. Three-quarter inch board will suffice for the shelf, F, and this will be screwed to the ledgers alone. This piece will of course be 10 inches wide only, instead of 11 inches.

The back of cupboard, H, is of half-inch board and 15 inches wide, that it may come flush with the outer surface of the sides. It has to be screwed to them as well as to the top, shelf, and bottom. Its lower end should be hollowed out in the same manner as the base of the front, as shown in Fig. 19.

The pieces forming the cornice and base (I and J, Fig. 20) are of three-quarter inch board; they are respectively 3 inches and 5 inches wide. They are mitred together at the corners. The way in which they are shaped and bevelled is shown in Figs. 19 and 21. As in the previous articles of furniture, the cornice is to be screwed on after the top of the pedestal has been covered with American leather cloth.

The dimensions of all the details of the door, which is of two layers of half-inch stuff, are clearly indicated in the diagrams. The construction of this door is precisely the same as that of the doors of the washstand described in my last article; and the methods of decorating the panel there suggested, can be adopted with regard to it also, at the pleasure of the workman. The back of this door is to be hinged to the front edge of the side.

My Handy Table for the Bedroom.—The little table which is shown in front elevation in Fig. 22, is more especially designed for bedroom use, though it may be found well suited for other purposes. It is pleasing in form, and so light as to be easily lifted. This elevation is drawn one inch to the foot; the diagrams which give details of its construction are on a two-inch scale. The dimensions of this table are: height, 2 feet 3 inches; length, 3 feet; breadth, 1 foot 10 inches It is supported on two pairs of legs, placed diagonally. One of the front pair, that marked A, Fig. 22, is given in front view on the larger scale in Fig. 23; and also in side view from above, in Fig. 24. Each of the four legs will have to be cut from a strip of inch board, 3 feet 1½ inches long by 3 inches broad. In Fig. 23, dotted lines have been left to show the outline of the strip before the leg has been shaped. At B, Fig. 24, is shown how each leg is cut half through at the point of intersection to receive the corresponding half of its fellow leg. In striking out the lines for this cut, the workman must observe that they will not exactly run at right angles to the edge of the strip, and he must follow the working drawing instead of using his square. The pair of legs having been fitted together will have to be pierced by the mortise, C, Fig. 23, through which will come the tenon of that piece of wood which will hold the two pairs of legs together.

The manner in which the lower parts of the legs are shaped to arcs of circles, as well as the various simple bevels and notches, which at the cost of little labour gives them a certain amount of decorative character, are clearly shown in Figs. 23 and 24. The notch D, Fig. 23, which by reference to Fig. 22, will be seen to be intended to admit the lower corner of

the drawer, will need to be cut in the front pair of legs only, as no drawer passes through the hind legs. In all other respects, the two pairs of legs are precisely similar.

The broad piece of board which, passing along and in front of the upper part of the legs, supports the top of the table, and which we have on the larger scale at Fig. 25, is of three-quarter inch wood. It is 2 feet $7\frac{1}{2}$ inches long, by 6 inches broad. Front and back alike will require one of these boards, but in that for the front only will it be necessary to cut the opening for the drawer, shown at E, Fig. 25. On measuring this opening against the end of drawer shown in the elevation, Fig. 22, it will appear to be somewhat smaller. This is because the end of the drawer, which projects half an inch from the face of the woodwork, is so made as to overlap. The ornamental ends of this board should first be carefully marked out, and will be best cut with a frame saw, should the workman possess such a tool; if not, little difficulty will be found in shaping them with the chisel, after a few judicious cuts with the hand-saw. This board will project in front of the legs, and will therefore have to be simply laid upon them, and clamped to them with stout $1\frac{1}{2}$ inch round-headed screws.

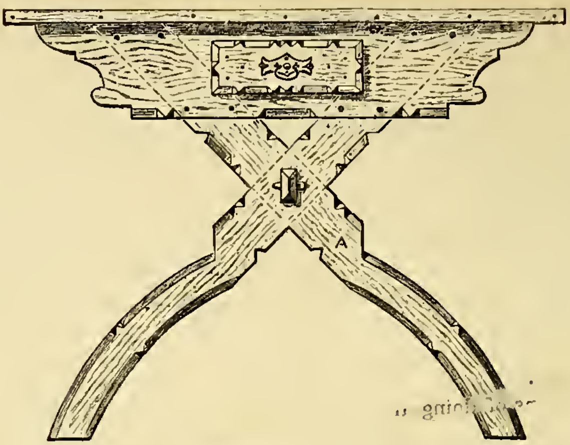


FIG. 22.—HANDY TABLE FOR BEDROOM.—FRONT ELEVATION.

As already mentioned, and as shown in page 458, Vol. I., in diagrams of a table of somewhat similar construction, the two pairs of legs are braced together at their intersections by a centre-piece of wood, which passes through them by a tenon at each of its ends, and is secured on the outer side by a peg. The end of tenon and the peg are shown, Fig. 22. Fig. 26 is a working drawing of this centre-piece. It is made of inch wood, $3\frac{1}{2}$ inches wide. From end to end it measures $21\frac{1}{2}$ inches. Its length between the legs from tenon to tenon, that is, is 16 inches. The tenons are shown pierced by holes for the pegs. These holes should be cut slightly nearer to the shoulders of the tenons than the thickness of the legs would seem to demand—less than an inch, that is—so that when the pegs are driven home they may draw the work tightly and firmly together.

This table has a drawer on the front side only, and as runners to carry it we may provide four strips of three-quarter inch board, 16 inches long and 2 inches wide; also, two other strips of the same, an inch wide and $10\frac{1}{2}$ inches long. The diagram, Fig. 27, which gives a view of the upper part of the front pair of the legs, etc., from behind, illustrates the way in which these strips are fixed. The shorter one, *a*, is screwed horizontally to the back of the legs, three-quarters of an inch below the opening of the drawer. Upon it are fastened the two bottom runners, *b b*, flush with the bottom and sides of the opening, and to them are fastened the two side runners, *c c*, whose office is to prevent any lateral motion of the drawer.

The outside measurements of the drawer are: length 16 in.; breadth, 9 inches; and depth, 3 in. Its ends will be best cut from three-quarter, its sides from half, and its

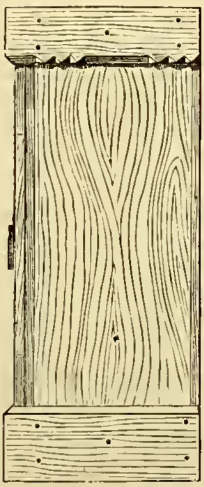


Fig. 21.—Side Elevation.

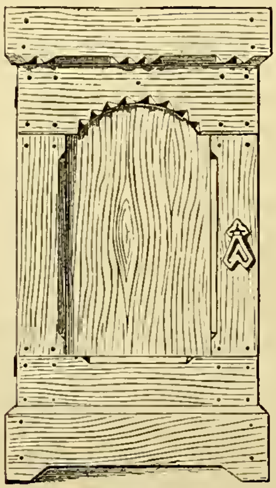


Fig. 19.—Front Elevation.

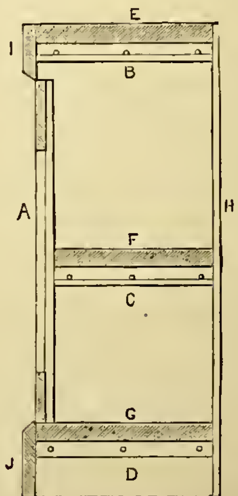


Fig. 20.—View of Side, Within.

CONVENIENT PEDESTAL CUPBOARD FOR THE BEDROOM.

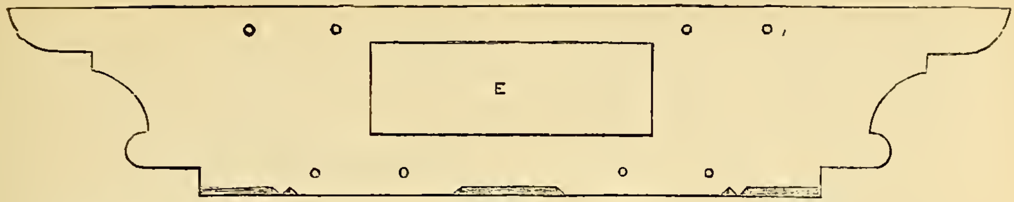


FIG. 25.—BOARD TO SUPPORT TOP OF TABLE, SHOWING POSITION OF DRAWER.

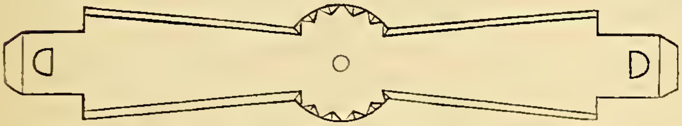


FIG. 26.—CENTRE PIECE CONNECTING LEGS OF TABLE.

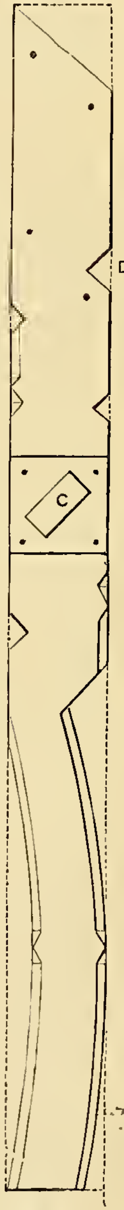


FIG. 23. FRONT VIEW OF LEG.

FIG. 24. SIDE VIEW OF LEG.

bottom from quarter inch stuff. Like all drawers, it will be strongest if dovetailed together, but failing the means [illegible] this, since its size and weight are inconsiderable, it may be sufficient if it is neatly put together with brads. After it has been made, a false front has to be added, and this front it is which appears in the elevation, Fig. 22. This front is of half inch board, and is to be both broader and deeper than the drawer by three-quarters of an inch—that is, it should measure $9\frac{3}{4}$ by $3\frac{3}{4}$. This will make it overlap the opening on every side by three-eighths of an inch. It is to be fastened to the front of the drawer by small round-headed screws, after it has been bevelled off in the ornamental manner shown in Fig. 22.

It remains only for the table to receive a top. This is to be of half-inch boards, 21 inches long, laid from front to back, and screwed down to the two broad boards. Over these last the boarding of the top will project three-quarters of an inch at either end. The top thus formed will be 2 feet 11 inches long, one inch less, that is, than the total length of the table when finished. As in previous articles, the top should be covered with American leather cloth, which in this case will require to be tacked to the underside of the edge of the table with much neatness, since our means of hiding any bungling work will be but scanty.

These means will consist of the narrow strip of wood with which the top of the table is to be surrounded. It is of half-inch board, and is three-quarters of an inch wide. This, whilst it hides the fastening-on of the cloth, will protect its edges, and generally give a finished appearance to the top of the table, which it will bring to the full size specified—namely, 3 feet by 1 foot 10 inches. These strips should be

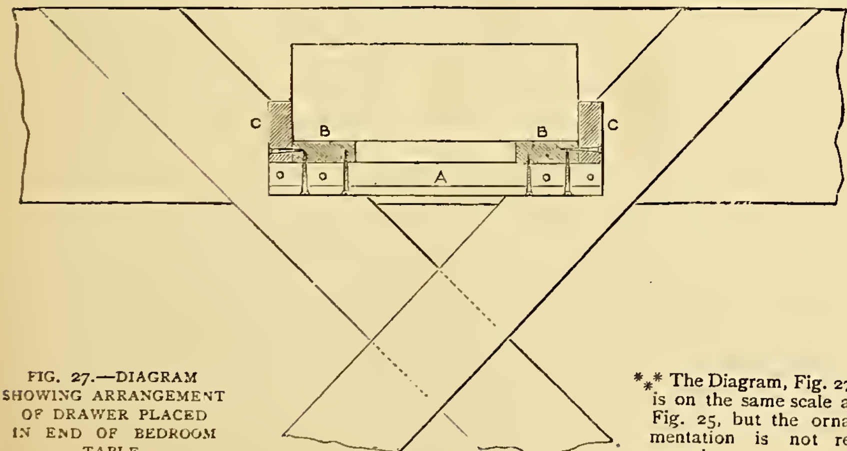


FIG. 27.—DIAGRAM SHOWING ARRANGEMENT OF DRAWER PLACED IN END OF BEDROOM TABLE.

*** The Diagram, Fig. 27, is on the same scale as Fig. 25, but the ornamentation is not repeated.

slightly rounded at both edges, and the upper edge should be placed slightly higher than the level of the cloth, say, the eighth of an inch. They are fixed to the table top by small round-headed screws, as indicated in Fig. 22. They are mitred together at the corners, and the corners can be slightly rounded off after fixing.

(*To be continued.*)

PRACTICAL SCENE-PAINTING FOR AMATEURS.

By HENRY L. BENWELL.

VI.—THE MIXING OF COLOURS (*continued*)—SIZE: ITS NATURE AND CAPABILITIES—PREPARING CANVAS—STRAINING CANVAS—FIREPROOFING CANVAS.

I NOW proceed to give a few general instructions for mixing the more delicate shades used for painting interiors. For straw colour, use whiting and Dutch pink, or yellow chrome; lavender, lilac, and French greys; white, lake, and indigo; vermilion and Prussian blue; indigo and rose pink; grey tints of a blue hue, white and verditer, or white and indigo; grey tints of a brown hue, Indian red and indigo, or burnt sienna, lake, and indigo; pea green, Prussian blue and chrome yellow; pink tints, rose pink or lake with white; violet, vermilion, Prussian blue, and lamp-black; chocolate, Spanish brown and white; fawn, white, burnt umber, and venetian red; drab, yellow ochre and black. I think the foregoing list will be sufficient to enable the painter to make a beginning, more so, as further instructions will be forthcoming as we proceed. A full table of tints will also be given towards the close of the work. It must be distinctly understood that whiting is mixed with all the colours I have enumerated, as without this the painter would fail to get the required tint, especially in those I have just mentioned, as suitable for interiors. I have jotted all these down just as they have occurred to me, so cannot vouch for them being absolutely correct. A great deal, too, depends on the manner of mixing them. Of course, the lighter the tint required, more is the whiting mixed with the colour.

By judicious intermixture, various other colours and tints can be produced. It may save disappointment to say that ultramarine does not mix at all well with some colours, muddy tints being the result; so it is best avoided where possible. With a little study the scene-painter will soon learn how to make a colour, if he does not happen to possess it. The primary colours are only three in number, red, yellow, and blue; they yield others by being compounded, but are not themselves capable of being produced by composition of other colours. There are also only three secondary colours, orange, green and purple, and these are each composed of two primaries, therefore, any neutral or semi-neutral colour, hue, tint, or shade, can be made by admixture with some of these, so the scene-painter need never be at a loss for any particular colour he may happen to have run out of. I have already said that yellows lose their strength by gaslight; I should also mention that by the same light, blues and purples have a tendency to go grey, and that reds increase in brilliancy.

The colours of which the various tints are to be composed should be ground up separately, the whiting being carefully added after the colours have been mixed. As far as can be calculated, as much of any particular tint as may be required for one scene should be compounded at once, to avoid the trouble and uncertainty of matching. The inexperienced painter may often think his colours are well mixed, when really such is not the case, for unless great care be taken, the colours will not be bound together, and when the painting commences it will be uneven and one mass of streaks. This may not be so much noticed whilst the colour is wet, but will show plainly as the canvas dries. Sometimes, too, when one colour is heavier than the others, it finds its way to the bottom of the paint pot, and when the quantity is partly used, it will be found to become gradually darker than that previously put on, whilst, if the brush be allowed to touch the bottom of the pot, it will contain a large percentage of the heavier colour, and so spoil the whole effect.

Great care should be taken in mixing tints—for some colours, such as Prussian blue, are so strong that very little of them will produce the desired tint, so that if they are used without due thought and care, it becomes necessary to again add more of the other colours, and so a greater quantity of the tint is mixed up than is really required. Orange and red lead are very heavy colours, and when using them they should be frequently stirred up with a stick or the palette knife. When the artist wants to know in a hurry what particular shade a tint will be when dry, he should brush a bit of the colour on a piece of primed canvas and dry it before the fire, when he will have the desired effect almost immediately.

Feeling that I have now arrived at a point where I am compelled to pause, from conscious inability to offer further instruction on this important subject, almost the most important part of this art, I cannot refrain from impressing upon the reader—at the risk of repetition—the strong reliance to be placed in careful study, perseverance and observation in the manipulation of his colours. Let the would-be scene-painter

also bear in mind that there are no methods by which to impart instruction, even in the most subordinate processes, unless the student exerts his own powers to the utmost and make good use of the information imparted to him, for, in the words of Sir Joshua Reynolds—"Nothing is denied to well-directed labour." I trust the reader is not beginning to mistake me for a moralist, such is not the case: I am only striving to give a little wholesome advice, and so, perchance, save my pupils many a little failure. I must now, however, leave the subject of colours and their mixing, and say a few words on the next most necessary article, viz. :—Size, the medium for binding the colours on to the canvas.

Size: its Nature and Capabilities.—In the days of Cimabue, Giotto, Fra Angelico, and other early painters, all sorts of media, more or less glutinous, and some very offensive in odour, were made use of in tempera painting. Pliny mentions milk and egg vehicle, as employed for ancient wall-painting. For various purposes, and at different periods, the white of eggs, wine, beer, gums, and other substances have also been used. Buffalmacco is related by Boccaccio—the latter of whom I have previously mentioned—to have once persuaded some nuns, for whom he was painting, to supply him with some of their choicest wines, pretending they were for the purpose of diluting his colours, but it appears that they were consumed by the painter himself as soon as his pious employers' backs were turned. When the more pure media was used, as employed by our ancient masters, who also made use of purer colours than we do now-a-days, the effect must have been very lustrous and powerful, in comparison with the modern scene-painters' distemper. Moreover, it is certain that these painters employed media of different degrees of consistency.

The medium used for binding the colours in scene-painting is known as size. It is made from gelatinous substances, and must be perfectly free from grease. When procured from the colour-shop it is in the form of a stiff jelly, and is sold either in firkins or by weight. There are two qualities of size now sold: "Patent Size" and the "best Double." The latter is much to be preferred, if for no other reason than that it will keep longer, without becoming offensive. In hot weather, however, size soon goes off. To prevent this, it may be warmed up, and a little carbolic fluid added; it may then be poured back into the tub, and will keep for any length of time.

Some painters are very fond of mixing with their size some treacle or "golden syrup"—about one quart to a firkin of size. This is supposed to make the colours work more freely from the brush, and assists to bind them on the canvas in a more satisfactory manner. There is one thing to be said about treacle, it is not affected so much by damp as size is, therefore, where scenery is liable to be stored in a damp place, it is pretty certain that the addition of a little "golden syrup" can do no harm. I have never, as yet, experimented to any satisfactory degree on this point, nor put it to a severe test; so, at present, I cannot speak from positive experience.

I will now proceed to offer a few directions for the preparation of the size. In painting a scene on a *new* "cloth," the first thing to be done, after the canvas is strained is to size it all over. This is done with what is technically known as *Strong Size*, *i.e.*, size melted in the kettle, with just sufficient water added to prevent its burning.

Size is ready for use as soon as it is melted, and does not require boiling, like glue. *Working Size* consists of one part of size to four parts of water; the size being first warmed up and measured, the requisite amount of water can then be added. When strong size and working size are mixed together in *equal* quantities, it is known as *half and half size.*

Ordinary glue can, in emergencies, be converted into size by boiling it up and adding sufficient water. To ascertain whether enough water has been mixed with the glue, allow it to cool, when, if fit for use, it should set in the form of a firm jelly. To ascertain if size is of the proper consistency while warm, the following test may be resorted to: Dip the fingers in the size, and then close them tightly together for about one minute; if, when separating, they adhere slightly to each other, the size is properly made; if, on the other hand, they stick together firmly, the size is too strong, and requires weakening. Again, if the fingers do not stick at all, the size is too weak, and would not bind the colours well. It is a mistake to use the size too strong, as it causes the colours to crack and peel off, and also gives the work a glistening effect, as if it had been "frosted."

I should like to say more regarding size, but space forbids.

Preparing the Canvas—Sewing.—It must first be decided whether stout unbleached calico or the best flax canvas is to be used for making the "cloth." The former of the two is, of course, the cheapest, and for cloths not larger than 14 feet wide by 12 feet high, it may safely be used. Beyond that size, I cannot recommend its use.

Having ascertained the dimensions of the scene about to be painted, the canvas must be cut to the proper lengths, of course finding out how many widths will be required, which will depend on the height of the cloth. Thus, a scene 12 feet high would take two double (72 in.) widths; a 15 feet cloth, two double widths and one single (36 in.) width; whilst one 18 feet high would take just three double widths.

Having cut the canvas, it must next be sewn with strong thread, the seams must be sewn twice, and are, I believe, generally known by needlewomen as "felled" seams. This is done to make the seams lay flat on both sides of the cloth. The seams must run *horizontally*, otherwise the cloth would not wind up level round the roller.

Straining the Canvas.—Having sewn the canvas, the next proceeding is to strain it on the painting frame. Commence to do this at the top, using ½ inch (or longer) *tinned* tacks, driving them in about half-way only, as they will have to be pulled out again. Having done the top, serve the two sides likewise, stretching the canvas tolerably tight; tack the bottom last, pulling out all creases, and leaving a perfectly level surface to work on. If the canvas happens to be no larger than the painting frame, this is a very easy operation, but I will suppose in this instance that the canvas is half as high again as the limit of the painting frame will permit, consequently we can only paint about three parts of the scene at a time. The canvas may he strained on the frame as before directed, the extra length lying on the ground. This should be neatly rolled up close to the frame, and covered over with some odd pieces of canvas. That part of the canvas (*i.e.*, the top part) already strained may now be sized, primed, and painted on, with the exception of about a foot from the bottom, which should be left, in order to join properly, when painting the lower portion. After the upper part of the picture is completed, withdraw all the nails from the bottom and sides, and with the aid of an assistant lift the cloth high enough to allow the bottom of it to just clear the ground, taking care that the upper and painted portion is folding itself evenly at the back; now tack down the two sides, straining out from the centre towards each side, and insert a few tacks along the bottom, but without straining the canvas from above, as it must be remembered that the fold or bight just taken in is not tacked at the top, the straining must, therefore, be done at the sides. The new surface can now be treated as before, using the size and priming hot, when the canvas should become as tight as a drum. There are various other ways of managing a cloth that is too large for the frame, but this, the most simple, will I think meet the amateur's requirements in full.

Sizing and Priming.—Having strained the canvas in a satisfactory manner, it should next be sized. To do this, heat some half and half size, and with a two-knot brush apply it to the canvas, working backwards, forwards, and crosswise. Keep the canvas well soaked, and take great care that not even a square inch remains uncovered. When the sizing is finished it must be allowed to dry, and the room should be heated to do this quickly if the painter is pressed for time.

As soon as the canvas is perfectly dry, the priming may be put on. Take as much whiting as may be required, and mix with strong size till about the consistency of good cream, or ordinary whitewash as used for ceilings, making sufficient to cover the whole surface of the canvas. Commence to lay on at the top, and work the priming well into the canvas, working the brush all ways, taking care that all is well covered and finishing off to the right. If the priming has been properly done, when dry, it should present a perfectly white and uniform appearance, and be ready for painting on.

Fireproof Canvas.—It may not be generally known that when canvas has been painted on several times, it becomes almost as good as if it were fireproof. This is because the canvas is itself covered to such an extent with uninflammable material that it will not flare, only smoulder. There can be no harm, however, in rendering the canvas (especially the "borders") fireproof, and for this I advise the use of Astrop's Patent "Cyanite," manufactured and sold by Astrop's Cyanite Company, 82, *Bishopsgate Street Within, E.C.* This liquid is recommended by Captain Shaw, the chief of the Metropolitan Fire Brigade. It is a fireproof liquid compound, and may be used alone or mixed with the colours. There are two descriptions manufactured. No. 1.—Prepared especially for canvas, ropes, dresses, and woodwork in connection with the stage. No. 2.—Is used as a varnish for all internal woodwork in the auditorium and other parts of the house.

The Asbestos paint, made and sold by the United Asbestos Company, Limited, of *Birmingham*, and 161, *Queen Victoria Street, E.C.*, is also a good fireproof covering for woodwork, but it must not be used for scenery. For old theatrical scenery one coating of "Cyanite" on the back, will in most cases render it fireproof. Having by this time made elaborate preparations, the painter should be in a position to set to work in a business-like way; therefore in our next chapter I shall show how to make and paint various kinds of prosceniums.

(*To be continued.*)

REVERSIBLE FOLDING SCRAP-SCREENS.

By JOSHUA BARWICK.

WITHOUT taking up space by making a chatty, amusing introduction, as the manner of some is, I wish to premise that the screen about to be described will require careful workmanship, tools kept constantly sharpened, and in good trim, and a

good stock of patience. This, by way of warning to those who are so ready to begin a job, and so prompt to abandon it at the appearance of unlooked-for difficulties. When finished, if carefully made as described, it will be a standing testimony of the maker's skill and enterprise.

To all who have at any time any piece of "framing" to make, let me commend these directions for setting out and working a simple piece of frame-work. When a door or sash, whether for a house or its furniture, is to be made, "truth" and "finish" can only be obtained by following the method here indicated.

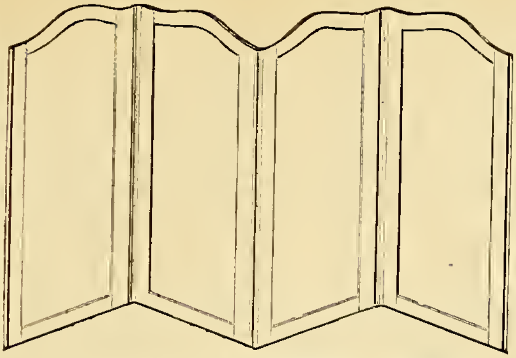


FIG. 1.—FRAMING OF SCREEN HINGED TOGETHER.

FIG. 4.—TENONS IN FRAMING AFTER GLUING.

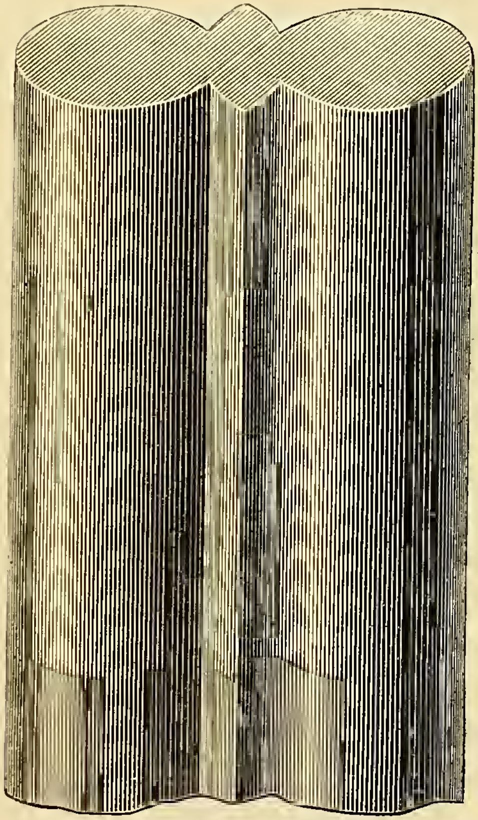


FIG. 3.—INTERMEDIATE HINGEING PIECES.

The choice of wood must depend on the amateur's taste, and partly also on his skill; as, of course, a soft, straight-grained wood, like pine, is much easier to work than walnut, or some kinds of mahogany. Probably the latter will give the best results; but choice should be made of a straight, even grain. Beware also of shakes, knots, and "galls." Finally, when choosing a board, take it up by one end, and holding it edge up, look along the sides from end to end, to see if it is straight. The *edges* need not be straight, but the *sides* must, as, if the board has cast in drying, it is useless for our purpose. A good size to which to make the folds is 6 feet high by 2 feet 4 inches wide.

Having obtained a supply of $1\frac{1}{4}$ inch board, line out thereon two stiles for each fold. I will assume that four folds are required Mark out then eight stiles, 6 feet 2 inches long by $2\frac{1}{4}$ inches wide; four top rails, 2 feet $4\frac{1}{2}$ inches by $2\frac{1}{4}$ inches; and four bottom rails, 2 feet $4\frac{1}{2}$ inches by 3 inches wide.

Here let me advise the intending screen-maker to read the whole of this article before procuring his board; as I shall later have to mention three other pieces,

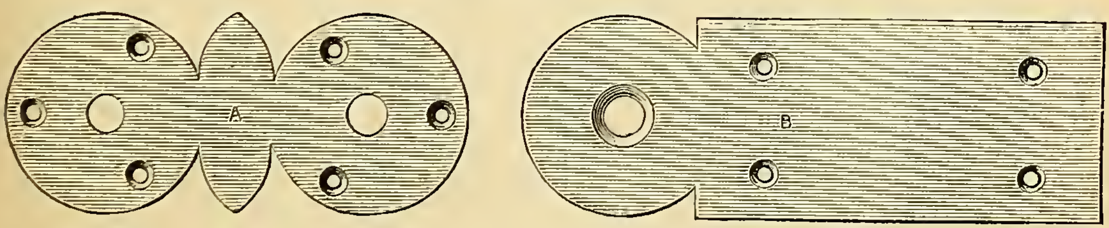


FIG. 2.—HINGE PLATES, SHOWING PART TO BE SCREWED TO HINGEING PIECES (A) AND PART FIXED ON FOLDS (B) AND PIVOTED ON CENTRAL PORTION OF HINGE, WITH SCREW ENTERING HINGEING PIECE.

which some may not be disposed to use. Allowance should also be made for an ornamental addition to the top rail. About 2 feet or so, the full width of the board, will suffice for this.

Instead of the straight top rail and ornament on it, a segmental curve may be given to it, as in Fig. 1. This gives more trouble, and perhaps does not afford so much scope for the amateur's own taste, but some may prefer it.

Having lined out all the parts, rip down true to line, and square. Plane up each piece straight and out of winding on one side. Then turn it, so that the planed side is next you, and, from it, square, and shoot straight, the edge thus brought uppermost. On this true face, and near the squared edge, pencil a "face-mark," which should also be carried over on to the edge. This indicates at a glance, in subsequent operations, the trued side and edge. Gauge to width from face edge, carefully bringing each piece parallel; and then gauge to thickness, running the gauge (from the face) along both edges. When all is thus wrought, line out for mortising, etc.

Begin with the stiles. Place them all on the bench, on their *back* edges, *i.e*, with the face edge up. Now arrange them so that four have their face-sides towards you, and four the opposite way. This is called "handing," and is done to ensure a right-hand and left-hand stile for each piece of framing. Having so placed them, fasten them securely together by means of hand cramps, or, better still, a number of knife-blades driven into the ends.

Square over, about an inch from either end, right across all the edges. This squared line represents the floor-line or bottom of the framing; mark off from this the width of the bottom rail, and square over. From this mark measure down again the length of mortise (about three-fifths width of rail), and square as before. From bottom line measure along the stile the whole height of framing, and square across at that. Then mark off, as before, for bottom rail, width of top rail and width of tenon, and square over both marks.

In addition to top and bottom rails, it is advisable to have two other rails equally dividing the space between top and bottom. These will, of course, be thinner, so as to just fill up the thickness between the two canvasses. Mortises for these must be set out according to width chosen for them.

Having set out all the mortises on the face-edge, turn the bundle of stiles up on its side, square a pencil-mark across the face of one of the two outside stiles; then square, across the back edges, all the mortises. Allow the mortise a trifle longer on the back edges than on the face edges, to allow room to insert wedges when gluing up. Cramp in the same way the top rails together, on their back edges, faces towards you. Square over at one end $\frac{1}{2}$ inch more than the width of the stile, and from this measure back the exact width of stile. Now measure off the exact length of rail; *i.e.*, the width of each piece of framing. From this measure in the width of the other stile, and square over. This gives the shoulders of the tenons on top rails. Set out bottom rails by marking off from one of the top rails, and squaring over.

The next step is gauging the mortises. Set the mortise-gauge so that the mortise shall be equidistant from both sides of stile. Gauge from the *face*. Run the gauge right along the face-edge of both stiles and rails, and on the mortises and tenons only on the back-edges; also the ends of the rails. Mortise the stiles, cut tenons on rails; shoulder them, and cut tenons to width, allowing $\frac{3}{8}$ inch "haunching." Rebate the face-edge of all the framing on both back and face to same depth, *i.e.*, down to mortise-gauge mark, and on the framing about $\frac{1}{4}$ inch.

Glue up, taking care to get each piece of framing square—all the rails exactly at right angles to stiles. This is best ascertained by accurately measuring the two diagonals, and cramping up so that they are just equal; and *must* be attended to before the wedges are driven, as it cannot be altered after. Set the framing aside for the glue to harden.

Meanwhile get out three hingeing pieces, as shown in Fig. 3, of the same length as stiles. Plane up straight and true, and gauge to width. Work the beads as shown, the size of bead depending on the thickness of framing. They must leave, when finished, two *round* edges to each piece. Clean off carefully both sides of framing. Place the folds edge to edge as you intend to hang them. Pencil a distinguishing mark on the *edges* which touch each other. In these marked edges work a semicircular groove to exactly fit the round edges of hingeing pieces. This will be done with a "round," about No. 9. The folds and hingeing pieces must be connected by iron or brass hinges, cut out of stout plate, to shape shown in Fig. 2.

Before hingeing together finally, the canvas must be nailed in, and polishing begun. After "bodying in" with polish, give it a rest for a day or two, which time may be conveniently occupied in choosing and arranging scraps. Fine canvas or good stout unbleached calico may be used, tightly stretched, and tacked into the rebate. Over this lining, paper must be very neatly and smoothly pasted. This, when dry, forms a perfectly smooth surface on which to paste the scraps.

Beading, either gilt, or of the same material as the framing, must be obtained or worked, and mitred

round in the rebates. If mahogany, they must, of course, be polished with the framing, taken out, and laid aside to paste in the scraps. When these have been put on according to taste, and become dry, carefully size and varnish, and fasten in the beads.

If it is not desired to make the hingeing reversible, the folds may be hung together with brass butts and a strip of leather or American cloth glued and tacked up the joint. Those who would like a reversible hinge, but feel incompetent to work the one described above, may obtain a similar result by using a strip with two square edges instead of the beaded one, and only half as wide. The folds being hinged to these strips, the knuckles standing out on alternate sides, can be swung either way.

NOTES ON NOVELTIES.

By THE EDITOR.

36. CAST'S PATENT AMATEUR'S SAW SET. 37. PALMER'S TOOLS AND APPLIANCES FOR BRASS REPOUSSE WORK. 38. A MEMORIAL PORTRAIT. 39. PARKER'S HAND-DRILLING MACHINE. 40. BRITANNIA COMPANY'S NEW CIRCULAR SAW MACHINE. 41. DAVY'S POLISH RESTORER. 42. TOURING ON THE TRICYCLE.

36. CAST'S PATENT AMATEUR'S SAW SET.—I have much pleasure in calling attention to this genuine novelty, because it is the invention of a young amateur who has taken out a patent for it, and has just now introduced it into the market. I find that the price of this most useful and handy article is 3s. 6d., but if any of the readers of AMATEUR WORK desire to procure it, they should address a letter, enclosing stamped envelope, to Mr. J. Hart, Engineer, 330, *Mile End Road, E.*, who has it on sale, and will promptly answer any inquiries that correspondents may wish to make with reference to this useful and most novel appliance. The form of the Amateur's Saw Set is exhibited in Fig. 1, and consists, first of all, of a turned handle, $4\frac{1}{4}$in. long, including the brass ferrule. From this handle proceeds a steel plate, $4\frac{1}{2}$in. long, $\frac{7}{16}$in. wide, and $\frac{1}{8}$in. thick, bent about $2\frac{1}{8}$in. from the handle, at an angle of about 40°. This bent plate is pierced at the extreme end with two holes, about $\frac{5}{16}$in. apart. And just on the other side of the bend, with two holes, rather less than $\frac{1}{8}$in. apart. In the hole nearest the bend, and on the upper side of the plate, a screw with a brass milled head is inserted, carrying a loose brass nut also milled, and a larger steel nut in the form of a six-pointed star, the points below being cut away to different lengths in the direction of the centre, to admit of the insertion of the triangular teeth that form the cutting part of the saw, in all sizes, from the smallest tenon saw to the rip saw. By the aid of another screw with a milled head and loose nut, entering the steel plate from below, as shown in the illustration, the hexagonal nut can be fixed to admit any thickness of saw-blade, and held immovable in the position in which it has been placed by turning down the loose nuts till they are brought in contact, one with the hexagonal nut, and the other with the plate. The teeth of the saw are then brought in succession between the nut and the plate, and bent by a gentle pressure on the handle. The screw with the milled head, and the loose nut at the end is intended to prevent the bending of the teeth beyond the proper angle by bringing the end of the screw in contact with the saw blade as soon as the necessary bend has been given to each tooth of the saw. The formation of the tool testifies, in a marked degree, to the ingenuity of its inventor, and the finish of the specimen before me in every part of the instrument, reflects equal credit on the maker.

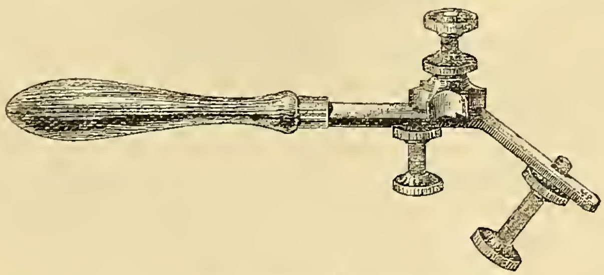


FIG. 1.—CAST'S PATENT AMATEUR'S SAW SET.

37. *Palmer's Tools and Appliances for Brass Repoussé Work.*—Mr. I. F. Palmer, metal worker, *Surbiton Hill, S.W.*, has sent for inspection a selection of his tools, etc., for repoussé work, or the art of raising a design from the flat in brass and other metals, consisting of an excellent hammer, four tools or punches for raising or punching out from the back on pitch, three tools for matting in the background, two tracers, curved and straight for outline, a pair of pliers for bending corners of brass, and a large and small piece of brass sheet specially prepared for this kind of decorative work, which are sold together in a box for 7s. 6d., and form a useful outfit for any amateur who has a fancy for it. A short, but highly practical set of instructions accompany the tools; but as I hope to commence a series of articles on this subject shortly, from the pen of an old contributor to this magazine, who has offered his services for the benefit of the readers, I will do no more than merely allude to them here. Mr. Palmer sent, with the tools, a specimen of work executed by an amateur, and the first piece on which he had tried his hand, which was highly creditable to the workman. The design was bold in itself, consisting of fruit and leaves, in relief, on a matted background, and suitable for the decoration of a coal vase or panel of a cabinet. It is said to have been entirely done from the front, and not hollowed out at all from the back. Mr. Palmer supplies every thing that is required for the practice of the art, and many readers may be glad to know that sheet brass, specially prepared, as I have already said, for this kind of work, may be bought of him at 1s. 6d. per square foot, with shears for cutting the brass, at 2s., wood blocks at 2s., and lead blocks (on which the postage is

1s.) at 1s. 2d. each. All the tools included in the box may also be had separately at prices detailed in Mr. Palmer's price list.

38. *A Memorial Portrait.*—I very much regret to say that the following letter from Mr. Gus Rochefort, Wholesale Picture and Show Card Frame Manufacturer, Carver, etc., 29, *Basinghall Street, City, E.C.*, reached me too late for insertion in the last Part of this Magazine. Mr. Rochefort writes: "Again I venture to trespass on your kindness in asking you to notice this small article, which I shall be pleased to supply to amateurs at 1s. 3d. each, packed and post free. As regards its value, those who have had my '1117' frames, will know that they received their money's worth. I offer this as a memento of the death of that great Statesman, whose portrait it is, and I put the price as low as possible in order to bring it within reach of any one who may desire something that will serve to keep his memory constantly before him." The "small article" to which Mr. Rochefort refers is an "In Memoriam" portrait of Benjamin, Earl of Beaconsfield, K.G. The portrait is at the bottom of an oval, surrounded by silver and black ground, with an inscription at the foot. Covering the oval at top, and reaching far down each side, are primroses and forget-me-nots—flowers which in this case speak as plainly as words. The picture is enclosed in a neat black-and-gold frame, $\frac{7}{8}$ inch wide, and 8 inches by 6 inches outside measurement. It is a nice picture for distribution to cottagers, etc., and as such I heartily recommend it to the notice of clergymen and country gentlemen, the secretaries of Conservative and Constitutional Working Men's Clubs, etc., to whom Mr. Rochefort might supply the portrait in large quantities at even a lower rate.

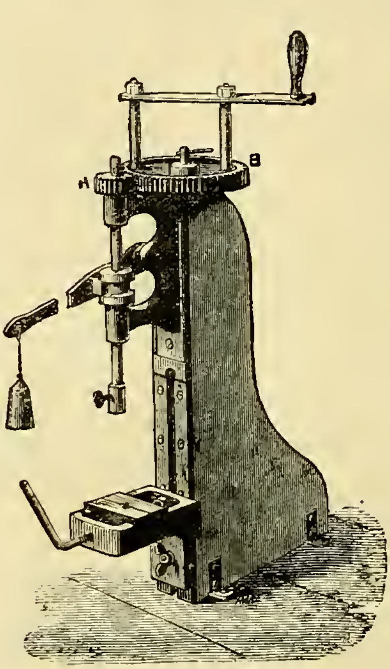


FIG. 2.—PARKER'S HAND-DRILLING MACHINE.

39. *Parker's Hand-Drilling Machine.*—The machine represented in Fig. 2 is the invention of Mr. Frederic W. P. Parker, 15, *Farndon Road, Oxford*, of whom it may be obtained by any one who may wish to add it to the stock of tools, etc. It is one that has been newly designed and recently produced for the rapid drilling of small holes, but with a slight alteration, only taking a few seconds, the speed may be so reduced that half-inch holes may be readily drilled. To reduce the speed from 3 to 1, to the same number of turns that the hand makes, all that has to be done is to place wheel B on drill-spindle A, and insert a taper peg. It will be noticed that a lever is used to work the drill up and down, this is not only much quicker in action than the ordinary hand-wheel, but also enables the operator to tell when the drill does not cut well, being much more sensitive. The wheel to turn the drill being placed horizontally, both hands can be more easily used at same time than in any other position. By placing a weight at the end of the lever the feed of the drill is made self-acting, and can be regulated to a nicety. One of the tables is formed somewhat like a box, with two movable V blocks and a set-screw, for the purpose of holding round bars in a vertical position, for drilling lathe centre holes, etc., and when once set true for a given size of bar, any number of bars may be drilled with centre holes that will be true for turning. The V blocks mentioned above can be removed, and a holdfast is provided for drilling holes in round bars placed horizontally. A long row of holes may in this way be drilled so that the drill will pass through the centre of the round bar and come out true the other side in every case. The spindle has a vertical rise and fall of $1\frac{1}{2}$ in., which is sufficient for ordinary purposes. The depth of hole to be drilled can be increased by raising the table when the traverse of spindle has been reached, and repeating the operation. The retail price of this machine is 25s., carriage paid.

40. *Britannia Company's New Circular Saw Machine.*—I have much pleasure in drawing the attention of the readers of this Magazine to a new, powerful, and useful machine that has been just produced, having been patented at the commencement of the present year, and which is well adapted for amateurs who devote themselves to wood-working, because so many of their requirements are met and satisfied by it. An excellent illustration of the machine is given in Fig. 3, and from this many of the operations that can be performed by its aid may be immediately recognized; it may, however, be as well to state specifically that it is especially adapted for pattern-makers, cabinet-makers, joiners, and picture-frame makers, acting, as it does, as a circular saw, fret saw, grooving machine, and for cutting in any direction, dowelling, and drilling. It is a treadle machine, and the mode and means by which the power is applied may be seen from Fig. 3. The circular saw makes from 1400 to 1500 revolutions per minute, and the fret-saw as many strokes. Cutting can be done up to 4 inches square with it, and some idea of the power and rapidity of the saw, when worked by foot, may be formed, when it is said that on one occasion after the foot of the operator was removed from the treadle, the velocity and momentum of the saw was so great that a length of 3 feet 8 inches was cut in a piece of mahogany one inch thick before the saw came to a standstill. For fret cutting there is a separate appliance, the upper arm being suspended from wall or ceiling, and only let down when it is wanted, thus leaving the table quite clear for work of any size. The means by which boring and drilling is effected is shown in the illustration, in which a bit is shown fixed and ready for work. Grooving is done by a thick saw, at a

speed much greater than by other saws. Dowelling is done on the adjustable table, which is shown at the side of the machine to the right, a special appliance being fitted for holding the work and insuring uniformity. The price of the Circular Saw Machine, including 3 Saws, is £15; Fret-saw Attachment, to suspend from wall or ceiling, £2 10s.; Mitre or Cross Guides, 12s; Adjustable Table for Drilling, £1 2s. 6d.

41. *Davy's Polish Restorer.*—This, it must be understood, is not a novelty in the primary sense of the word, but I make no hesitation in mentioning it here, because it must, of necessity, be new to many, and I do not see why a good article of obvious utility should be excluded from "Notes on Novelties" because it has been before the public, as in this case, for about twenty years. Everything must be new to every one of us when it is first brought under our notice, and it is in no way less novel because somebody else has seen it or used it before. I say this in order to save any one to whom it happens to be already known the trouble of telling me that it is not a novelty, and upbraiding me with my ignorance in the matter. I am not a prophet. I do not know every thing, and I am always ready to learn, and judging that the bulk of my readers are much of this sort, those that sit in the seats of the scornful being always excepted, I take my way accordingly. But to Davy's "Polish Restorer." This is a preparation that is made and sold only by Mr. H. W. Boughton, *Market Place, Thetford, Norfolk*, at 6d. per bottle, or 8d. post free, four bottles being sent post free for 2s. 6d. Mr. Boughton, who has used this preparation for some years, recommends it for the use of amateur French polishers, as being the best and safest medium he knows for cleaning off—better, in fact, than methylated spirit, as there is no fear of taking off the polish in patches, as may be done with spirit. Special instructions for the guidance of French polishers will be enclosed with the Restorer to those who require it for this purpose. Another use for which it is eminently well calculated is for cleaning and reviving all kinds of polished furniture, such as chairs, tables, sideboards, pianos, etc. When used, the bottle should be shaken, and a small quantity applied on flannel to the surface of the article under treatment. This done, it should be rubbed with a piece of soft linen, when a most brilliant polish will be the result. It is useful, further, for reviving leather of every description, leather bags, the binding of books, American leather, cloth, etc., being wonderfully revived by its application. The mixture must be well shaken before it is used. I may say that I find it imparts a splendid gloss to polished furniture. On applying it to a volume bound in calf, whose back was worn, I found that it darkened it and did not give any particular brightness to it, but on the sides, where the leather was not so much worn, it certainly improved its appearance. I think it should be applied very sparingly to leather articles, unless the surface is unbroken. It will increase the lustre of anything whose surface is already polished and has become dull, but it will not give a polish to any leather surface that is rubbed and worn. At least, this is my belief after the single trial to which I have yet put it.

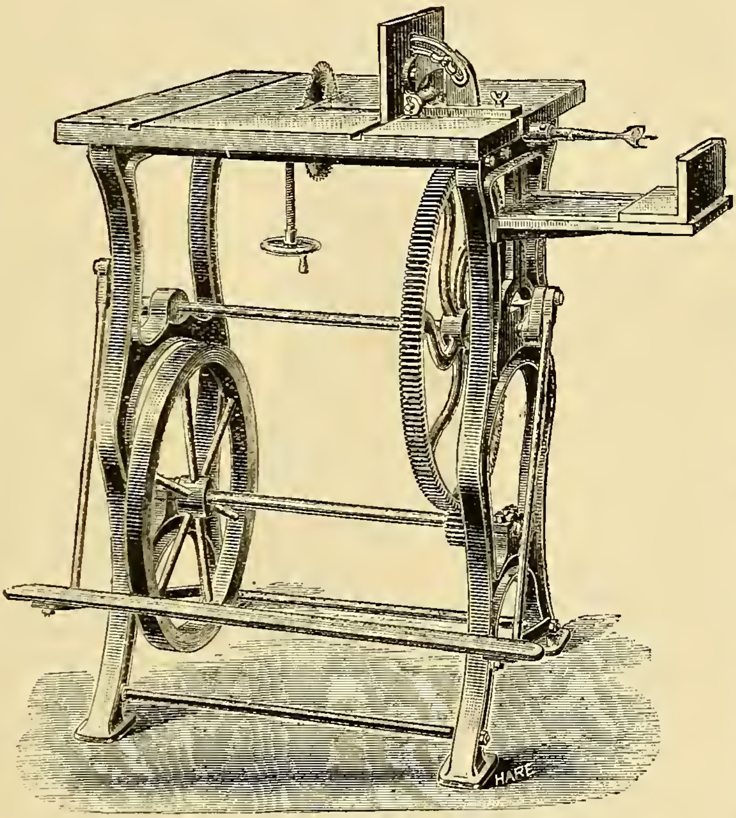


FIG. 3.—BRITANNIA COMPANY'S NEW CIRCULAR SAW MACHINE.

42. *Touring on the Tricycle.*—Readers of AMATEUR WORK, who are tricyclists and bicyclists, will be interested in knowing that a most exhaustive series of articles on Touring on the Wheel, are now appearing in "The Tricyclist," from the pen of that Ex-Champion Amateur Path and Road Rider, Mr. Lacy Hillier. They are eminently practical, and deal most completely with the subject. Preliminary practice was first treated. Then comes the section at present running, viz., Sartorial—Dress for Ladies and Gentlemen who Ride the Wheel; each section occupies several chapters, and the work is sure to be of the very greatest service to everyone who undertakes a cruise upon wheels.

AMATEURS IN COUNCIL.

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine, the information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

Index to "Amateur Work."

A. W. W. (*Gateshead-on-Tyne*).—An index is issued for every volume of the Magazine, and was given gratis—for Vol. I. in Part 12, for Vol. II. in Part 24, and for Vol. III. in Part 35. The Supplements and Folding-Sheets cannot be bought without the Parts, but, as the Parts cost only 6d. each, you can replace your imperfect Parts at no great expense. I cannot tell you what would be the cost of printing fretwork designs. It depends on the size, the style in which they are produced, the paper used, and other items which combine to influence the cost of production.

H. F. K.—I am obliged to you for your suggestions, but *conflicting interests* of various kinds render it difficult to do all one could in these matters. Indexes when badly done, as in Vols. I. and II., are next to useless, and, when properly done, and *every item* in the work to which reference should be made is registered, they occupy much space and cost money in compiling, setting, and paper, which tends to reduce profits. These are small enough as it is, in the present case, and will not bear further reduction. Nevertheless, if it is possible to adopt any of your suggestions, I will not fail to take advantage of them.

Canvas-covered Sailing Canoe.

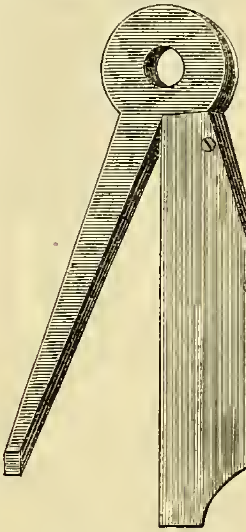
Warded Borsenusch (*Syra*).—I am glad to receive evidence that Amateur Work has found its way into Greece. You will see that your request for a paper on this subject has been anticipated by the appearance of a paper on the subject in this month's issue (Part 41, April, 1885). The instructions will enable you to build a canvas-covered canoe of the length you require—namely 13 feet. If you wish to know anything further on the construction of paddles, or rather a double paddle, suitable for the canoe, send word to that effect per post card, and you shall receive an answer.

Designs for Poultry Houses, etc.

Silisili.—You can send designs for poultry houses, runs, coops, etc., on approval, if you like, but until I see them and read the descriptive papers that must accompany them, I cannot possibly say whether or not they would be acceptable or accepted.

Centre-Square.

H. W. (*Newton Abbot*) writes:—"I send you a rough sketch of a centre-square of home manufacture. It is very inexpensive, sufficiently accurate for all ordinary purposes, and requires no very great amount of skill to make. The main points are to be careful in getting both sides of the angle true, and a true line of the overlying-plate accurately fixed in centre. I made mine from a piece of sound old oak, which I happened to have, ¾ inch thick, but anything hard and not apt to warp will do, and my plate is of German silver, but brass or zinc would do very well. The angle and size are immaterial, except that the greater the angle and the longer the arm, the larger the circumference which can be centred. Mine has an angle of about twenty degrees, that is to the mid-line of the plate, and this, with the legs 6 inches long, enables me to clasp anything to be centred up to 4 inches or 4½ inches. The rounded top is only for strength and convenience in holding, and the hole is to hang the instrument up by when not in use. I hope not much explanation is necessary as to the mode of application. It is simply placed over the rod or other work to be centred, and two or three lines crossing each other scribed along the plate line, and the exact centre is indicated, which can then be struck with a punch. On the subject of centring it has often seemed to me curious that in books for beginners, whilst they tell you first *to centre the work*, they never tell you how. A very simple way of centring a rough piece of wood,



HOME-MADE CENTRE-SQUARE.

for instance, which has irregular sides, is to place each facet on the side, in succession of each end, flat upon the bench, and with compasses fixed with the screw to a little over the half breadth of the end; resting one foot of the compasses on the bench, strike a line with the other point each time across the wood, and when this has been done all round, there will be found either a central point or space which will show where the holes are to be made for fixing in the lathe. I have never seen this plan described, though it is one in common use 'in the shops.'"

Inlaying in Veneers.

B. (*Canterbury*) wishes to have instructions for Making Draught-Board and Backgammon Box and Board, offered by Mr. W. J. Stanford, and will be grateful for hints and designs for work-box and writing-desk, having succeeded in making a beautiful table by following the instructions given. To this I may reply (1.) That space in Amateur Work is very valuable, but that if it is the decided wish of many readers to have the information asked for, it shall be given, but at what time I cannot say. (2.) With regard to your remarks on "Boot and Shoe-Making," I can only repeat that Mr. Abel Earnshaw has not chosen to reply to the last two or three letters I have written to him. If you will state any difficulty about mending in which you may happen to be, I will endeavour to get it cleared up for you. (3.) I cannot interfere with Mr. Zilles' method of advertising. You must address your remarks to him. (4.) I cannot tell you when instructions on Harmonium Building will be given.

Making Accumulators.

A. M. H. (*Edinburgh*).—It is sheer waste of time for me to describe, and you to attempt making an accumulator to light up three 50 volt lamps—the accumulator to be charged by battery power. You will find it far more satisfactory and economical to light up the lamps with current from a dynamo machine or a powerful primary battery. But here, also, the "game will not be worth the candle," with 50 volt lamps.—G. E.

Sparham Camp.—As all forms of accumulators are patented, you will run a serious risk in attempting to make them. The plates should be 12 by 15, and arranged in pairs, 6 pairs in each cell. You would require at least three of such cells. Charge one cell at a time from your dynamo and connect them together in series after you have charged them. The plates will require to be "formed" by charging and discharging the cells several times before they will furnish enough current for electric lighting. Connect the lamps in "parallel" with the accumulator. I suppose you know how to make an accumulator, *i.e.*, one of the old Planté or Faure forms. The latest types, as you may know, are more difficult to make than those. Why attempt it, save for amusement? I am glad to hear of your success with the machine.—G. E.

Blue Printing Process.

F. W. (*St. Augustine, Florida*) writes:—"G. D. C., in his answer to H. S., makes a serious mistake. He says, 'I see no reason why it (viz., sensitising first with ammonia citrate, and *developing—not* sensitising, as he has it—afterward) should not answer, *as the solutions are only sensitive to light when mixed*,' etc. Now this is wrong. Ammonia citrate of iron, both in solution and applied to paper, is sensitive to light. Ferrid cyanide of potash (red prussiate) is totally unaffected by light. A *ferric* salt, when exposed to light, becomes a *ferrous* salt; that is the action. There is a slight advantage in using paper sensitised with ammonia citrate or ammonia oxalate of iron alone, and developing afterward with red prussiate. The paper keeps better. By the bye, let me recommend amateurs to use ammonia oxalate of iron. It is a little troublesome, but very interesting, to prepare, and gives beautiful results."

Gilding Corners of Frames.

H. G. W. (*Canterbury*).—All necessary instruction in gilding of every kind is given in the papers on "The Art and Mystery of Gilding," Vol. III., pages 49 and 147. These papers are in Parts 25 and 27, price 6d. each, if you do not happen to have the volume.

Velocipede Fret-Saw.

F. W. (*St. Augustine, Florida*) writes:—"In reply to ROSELEA's remarks (page 202), I have two velocipede saws. One has strained vibrating arms, and, of course, the cut is a segment of a circle. The other (Barnes' No. 7) has the saw connected to guide bass running between guides. The straining is accomplished by a leather strap. I like the saw better than any saw I have tried, and I have tried all the best makes. I have Barnes' No. 4 Velocipede Lathe. I cannot say too much in praise of this form of foot-power. About two years ago, I think, I wrote to the Editor about Barnes' machinery, and sent him a catalogue, which he noticed in 'Notes on Novelties.'" [Yes, this was so! The notice to which you refer will be found in Vol. II., page 242, in Part 16, dated March, 1883.—ED.]

Barnes' Velocipede Fret-Saws.

MESSRS. CHURCHILL AND CO.—I am in receipt of your letter of Feb. 28, enclosing pages from your Catalogue with illustrations and descriptions of various lathes, velocipede fret-saws, etc., by Messrs. Barnes, of *Rockford, Illinois, U.S.* You write: "We notice in AMATEUR WORK for March, in 'Amateurs in Council,' you congratulate L. S. D. (*Jamaica*) upon being the introducer of Messrs. Barnes' machines into this country. In reply to this we beg to inform you we have sold the machines made by Messrs. Barnes for many years; and, if you refer to our Catalogue for October, 1883 (which you noticed at the time), you will find full particulars of the Velocipede Machines—also others of the same makers, all of which we have had in stock and supplied very extensively in this country." To this I may reply that I was advised of the Velocipede Fret-Saws by two American correspondents, one being L. S. D. (*Jamaica*), and the other F. W. (*St. Augustine, Florida*), who has opportunely reminded me that he wrote to me on the subject of these saws *two years* ago, and that I then mentioned them in "Notes on Novelties." In confirmation of this I have much pleasure in referring you to Vol. II., page 242 (Part 16, March, 1883), where you will find the notice to which I allude. *Six months after this, the Velocipede Fret-Saws, by Barnes, appear, for the first time, in your Catalogue, dated October, 1883.* I say *for the first time*, because I fail to find any notice of them in your Catalogue for 1882, to which I have just made reference, though I find notices of Barnes' "Patent Combined Scroll and Circular Saw" and "Patent Foot-Power Scroll Saw," neither of which are machines fitted with velocipede action, and the seat which permits this action to be put in force. It was this special feature to which I drew attention in terms of commendation in Vol. II., page 242. I am ready to allow that my knowledge of American tools and machinery is very slight when compared with yours, and that most of it I owe to others; but in this instance it is clear beyond dispute or denial that attention was called to Barnes' Velocipede Fret-Saws in AMATEUR WORK before you offered them for sale, per Catalogue of October, 1883. With regard to what you say about "many of the 'new' and 'special' novelties," often referred to by correspondents, being, in reality, very old and well known for some time to you, and kept in stock by you, let me say that this would be obviated if you would take the trouble to send me from time to time notices of novelties that reach your hands. You know that I am always ready to mention any tool or machine that you bring under my notice, and you might remember that it is for inventors and makers to make editors of practical serials acquainted with the new things they have on hand, and not to leave it to the editors to hunt up these things for themselves. Further, you say: "Also, regarding the Shipman Engine by same correspondent (L. S. D. [*Jamaica*]), we have had the engine some months ago; but as it is being considerably remodified and improved, the engine was called back and not put on the market. When the new one is ready, we shall be glad to advise you and show one. Undoubtedly it is the best motor we have as yet seen." I shall be glad to know when the engine is ready for view, and I am sure there are many who are interested in motors who will be glad to call on you at 21, *Cross Street, Finsbury, E.C.*, and have a look at it.

Hints to Fret-Sawyers.

P. B. (*Devonport*) writes:—"Having seen various methods described for copies of fretwork patterns, I will now give another by which any number of copies may be had without any injury to the original. From the original take a tracing in lead pencil, and ink in the outline with violet copying ink. Then transfer to the Copyograph, from which any number of copies may be taken. Instructions for making the Copyograph are given in pages 528 of Vol. 1, and 443 of Vol. III. of AMATEUR WORK."

Music-Printing Outfit.

G.W. (*Buckingham*) writes:—"The music-printing apparatus you speak of is, I believe, the same as that made by Mr. J. Francis, *Rochford*. He is also the inventor of some patent music type which anyone may set up. I send you his circular, also a specimen of work said to be done with the 10s. 6d. music-printing outfit." [The specimen sent is a very creditable piece of work for an amateur printer. Anyone curious about the "Music-Printing Outfit" and "Patent Universal Music Type" should send for prospectuses descriptive of each to Mr. Jabez Francis, *Rochford, Essex*, the inventor and manufacturer of these useful appliances.—ED.]

MUSICUS writes:—"Referring to No. 264 Exchange, and your notice in last number, allow me to give a description of one supplied at 10s. in my possession, and which any one may have at half price. Condition better than new. 1 strip of wood $4\frac{3}{4}$ inches by 1 inch by $\frac{1}{4}$ inch, with saw-cut from each end down centre to within $1\frac{1}{2}$ inches of each other; 1 strip of wood $5\frac{1}{4}$ inches by $\frac{1}{2}$ inch by $\frac{1}{2}$ inch with two French nails $\frac{1}{4}$ inch apart near centre and two bits $1\frac{1}{2}$ inches by $\frac{3}{4}$ inch by $\frac{1}{2}$ inch, each nailed on one side about an inch apart, with tongue of concertina reed as spring between; 1 strip of wood, $4\frac{1}{2}$ inches by 1 inch by $\frac{1}{4}$ inch, with wire pin near each end; 1 ruling pen made of thin brass bent zigzag and fixed in small wooden holder; 1 inking pad (penny india rubber) in 1d. vesta box; 2 ounces graph composition in tin box; 1 bottle stamping ink, weighing altogether $\frac{1}{4}$ ounce; 1 bottle of stave ink (aniline), weighing $1\frac{1}{4}$ ounces; 20 musical characters in tin holders, half can be used in one position only and two in no position whatever; 3 loose figures; 1 J pen; 1 scale, evidently printed from an iron foot rule, ground black, figures white and backwards. 3 pages instructions. First paragraph:—'Provide a piece of planed deal about 1 foot square,' etc., etc., *i.e.*, make the apparatus. The multiplying is by graph, which must be first made. Last paragraph:—'If a great number of copies are required, the first one should be done on 'transfer paper' with ordinary lithographic ink; this should be sent to a lithographic printer, who will furnish any number of copies from the one sent to him, *which will appear similar to the specimen sent out with the advertisements.*' The italics are mine."—[MUSICUS does not give his name and address, so I cannot forward letters from any persons who may wish to have this "better than new" outfit at half price. MUSICUS should have sent name and address of maker of the outfit he describes.—ED.]

Practical Lessons in Wood-Carving.

H. H. (*Canterbury*).—You will see from the paper that appears in this Part that this series of articles is not completed.

Instruction in Wood-Carving.

E. A. T.—There is a first-class School of Instruction in Wood-Carving at the South Kensington Museum, and persons residing at the West End of London can easily procure terms and prospectuses by addressing The Manager, *School for Wood-Carving, South Kensington Museum, London, S.W.*

Storm Glass.

T. G. B. (*Liverpool*) writes:—"I have made a storm-glass upon the principles given by Mr. C. Clarke, in 'Amateurs in Council,' page 481, Vol. I., Part 10, and am sorry to say it does not act, as the evaporation seems to be very great. I covered the glass tube with a bit of bladder. I write this only as a result of my experience."

Cheap Microscope.

A DISAPPOINTED ONE writes:—"I should like to know whether any of the readers of AMATEUR WORK have succeeded in making a Cheap Microscope, after the plan laid down by Mr. Beckerlegge. I have tried, but have not succeeded, although I have, I think, followed the instructions. I find it impossible to view anything, except as a cloud on the field of vision. Will this be caused by the eye-piece lens being a double convex instead of a plano-convex, as directed by Mr. B., that being the one supplied to me by the optician Mr. B. will, perhaps, explain, and others who have made the microscope, or tried to make it, give their experience."

Rendle's Paint Remover.

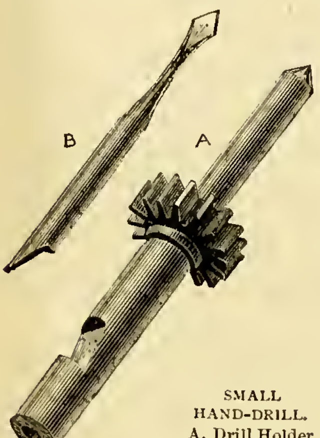
NEPENTHE writes:—"I wish to mention complete success in the use of Rendle's Paint Remover, upon an old japanned chest of drawers, leaving a surface upon which Stephens' Stain for Mahogany took splendidly."

American Organs.

Juno (*Surbiton*).—No arrangements have yet been made for papers on this subject. Space is limited, and other subjects are in hand which have a prior claim.

Small Hand-Drill.

Ajax writes:—"In connection with reply to W. B., page 251, I may mention a little contrivance which I have found very useful for small work, and it has the advantage of a continuous forward action at a trifling cost. Having procured an American rotary egg whisk, usually sold at 6d., I removed the central shaft of stout wire carrying the heater, as well as the small spur wheel which runs loose on same, leaving only the larger wheel attached to the handle. I next hunted up an old key of suitable size, and, having the barrel bored to the depth of about 1 inch, cut off the bow and ward, and fitted the barrel to the handle in the place of the wire shaft; but the key being thicker than the wire, the recess had first to be enlarged to receive it, thus forming a socket for the spindle to work in. I then took a piece of round steel, about 2½ inches



SMALL HAND-DRILL.
A, Drill Holder.
B, Drill.

long and ¼ inch diameter, filed down a sufficient length to fit smoothly in the key barrel, with the end brought to a blunt point for bearing, fixed the spur wheel on to the centre so as to gear properly, after which, placing the spindle in position and grinding away on to a drill-bit fixed in vice, I bored the hole in the end to receive drills, and filed a slot to fix them. Not considering it necessary to attach the spindle immovably to the handle, the drill was now complete, and it proved so good a tool that I did not regret the time and labour spent upon it. I enclose a rough sketch of the spindle, the other part being probably too well known to need description. The drill-bits are those used with the 'Archimedean,' with tangs to the shanks."

Pattern for Triple-Geared Headstock.

A. F. S. (*Dresden*).—You have hardly defined your case clearly. For instance, you talk of your pattern being in halves, when there is no necessity for this—at least, to judge from the sketch sent—and I must tell you that patterns are very seldom mortised, being mostly screwed, except for a large quantity of castings. You also show a core print on your sketch, though for what reason I cannot see. If you will send me a sketch of your headstock showing its details, I will describe the pattern fully for you. With reference to the latter part of your question—namely, how to connect and fasten the lower piece, marked A in your sketch, to the upper piece, marked B—you should rabbet A down about ¼ inch, and let B into it, and then screw from the bottom side of A. You will make a strong job of it that way. Of course, any small washers or bosses that project beyond the sides must be loose, to enable the moulder to draw the pattern clear from the sand. However, send a complete sketch, and I will then do the best I can for you.—A. J. S. [I have redeemed my promise to seek aid for you from one of the best pattern-makers in England, and you see what he says.]

Lathe Castings.

A. W. W. (*Gate-head-on-Tyne*).— For lathe-castings, apply to the Britannia Company, *Colchester*, or A. A. Dorrington, *West Gorton, Manchester*.

Electric Clock.

L. M. (*Condé, France*).—Mr. Edwinson has sent me your letter addressed privately to him, and your paper in French describing your *Horloge Electrique*, or Electric Clock, with three sheets of illustrations. It requires translation into an English dress for appearance in Amateur Work. I should like to produce it as you have written it, but I fear the information the paper contains would be lost to many readers of the Magazine, who would otherwise welcome it. I will take charge of the paper, and will have it translated for production at an early opportunity. By the way, let me say that *papers* intended for appearance in Amateur Work should be sent to the Editor direct.

Telegraph Instrument Coils.

E. C. C.—The coil for a small single needle telegraph instrument is formed similar to that of a current detector. An illustrated description of this was given in Vol. II., page 76. The coil of a toy telegraph instrument can be made by winding two layers of your No. 32 wire on a bit of folded cardboard. A full description of all the parts of a telegraph instrument would take up too much space here. I hope, however, to take up the subject fully at some future time.—G. E.

INFORMATION SUPPLIED.

Chucks used by Amateur Model Makers.

F. W. (*St. Augustine, Florida*) writes in reply to S. M. L. (*Goderich, Canada*):—"The most useful chuck for model work to me is the face-plate; that and a 'Champion,' which I use for drilling and holding small things, are all the bought chucks I have, and made an engine 1½ inch bore by 3 inch stroke. I bored the cylinder myself, material cast iron. Of course, I use many chucks of wood of my own make."

Text Books on Mechanics.

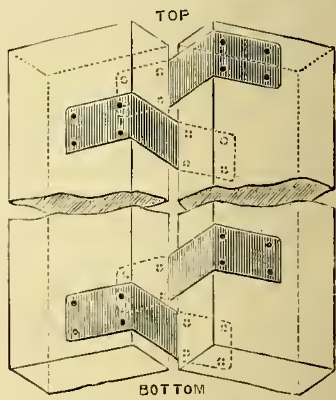
F. W. (*St. Augustine, Florida*) writes in reply to S. M. L. (*Goderich, Canada*):—"Let me recommend 'The Young Mechanic' (G P. Putnam's Sons, *New York*, Publishers, American Edition.) 'Turning for Amateurs' (London: Bazaar Office.) S. M. L. will then learn all about chucks. He can get the books from Goodnow and Wightman, *Boston, Mass, U.S.*"

"The Boy Engineers."

Roselea writes in answer to query of S. M. L.'s (*Goderich, Canada*):—"Regarding 'The Boy Engineers,' I can tell him that I have the book. It is published by Trubner and Co. The contents are: I.—Introductory. II.—Our Work. III.—Workshop Appliances. IV.—Our Wooden Clock. V.—Some more Automata. VI.—Our First Organ. VII.—Our House. VIII.—Our Workshop and its Fittings. IX.—One or Two Engines. X.—Our Carving Machine. XI.—Our Electrical and Pneumatic Apparatus."

Cheap Hinges for Screen.

Νοῦς writes:—"In reply to Veto, in February Number of Amateur Work, 1885 (Part 39), I think the following will meet his case. I believe it to be impossible to make a draught-tight hinge for screen, except by means of universal joints. The following is an equally simple method of making the folds open both ways. A short



WEBBING HINGES FOR SCREEN.

distance from the top and bottom of one old, nail the ends of two bits of strong webbing as close as possible to the inner edges of one face; nail the ends of two other pieces close to the inner edge of the other face. Carry them alternately round, and nail them respectively in the same manner as the other fold, drawing them as tight as possible. The accompanying outline sketch sufficiently indicates my meaning."

Best Chuck for Model Engine Work.

A. F. S. (*Dresden*) writes, in reply to S. M. L. (*Goderich, Canada*):—"You will find the most useful chuck for small discs, etc., to be a small well-made four-jaw chuck—*not* self-centring, mind you."

Varnish Hardening.

Casenhem replies to J. B. (*Stoneham*), page 206:—"All varnishes should be kept in well-corked or stoppered bottles. I prefer the latter for small quantities. Your varnish hardened in the same way you wished it to do, when applied to the carvings, viz., the turps and spirits evaporated through exposure to the air, leaving the gums behind."

Designs for Accordeon Box.

W. J. S writes in reply to JUNGLE JACK (page 255):—"I send you the designs you ask for, but as you only gave me the inside dimensions of the box, and gave no idea of of the thickness, etc., I could not draw them to the right size, but have allowed 1 inch every way, on the supposition that your box is made of ½ inch stuff. If you are going to inlay on a box of your own construction, remember to mitre the joints and not dovetail as I saw recommended in a well-known mechanical journal; you cannot glue over dovetails. The choice of veneers must rest with yourself. I suggest that the stars be made of mahogany and holly in alternation. In the big one you might fill in the recesses with oak, and run a band of stringing round the whole. Outside that yacca or amboyna, yacca if possible. Then a different stringing, black, a straight line of the same stringing, and fill up with walnut, putting black corners. The design is a very simple one as there are a great many right angled triangles; and if you use my plan of making a mould for each triangle you will have no difficulty with it. The front design speaks for itself. If you do not see at once how it is made, draw a hexagon and construct an equilateral triangle on each side, and by joining the vertex of each triangle with the centre you will get your star. As your groundwork is of walnut, the grain of every piece of the walnut must run longitudinally, as it would in solid wood. All other grains should converge to the centre."

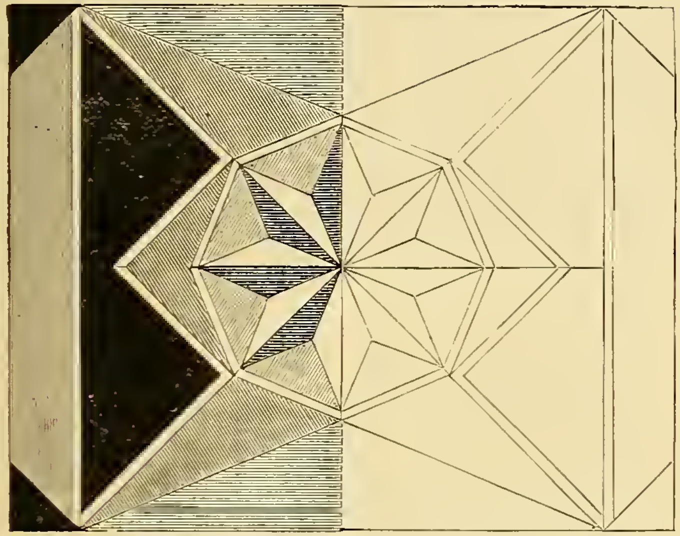


FIG 1

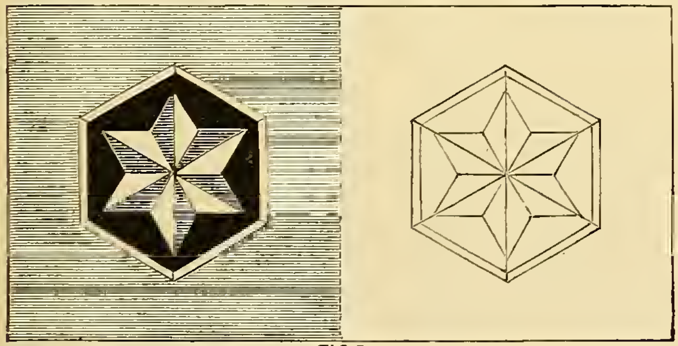


FIG 2

DESIGNS FOR ACCORDEON BOX. FIG. 1.—PLAN OF TOP. FIG. 2.—PLAN OF SIDE. SCALE, ONE-FOURTH ACTUAL SIZE.

Electrical Musical Printing.

CASENHEM can assist J. T. (*Exeter*), page 152, in making such an apparatus, but is afraid that it is scarcely sufficiently interesting to suit many of the readers, but, with the Editor's permission, he will try. He can explain, in a very few lines, a method that will be intelligible to J. T. (*Exeter*), if he knows anything about electricity. [Permission is given. I think I may say that J. T. (*Exeter*) does know something about electricity—see page 205.—ED.]

Compensating Pendulum.

CASENHEM writes, in reply to T. B. T. (*Carnew*), page 152:—"The following may suit you for a seconds pendulum, *i.e.*, a pendulum beating seconds. It is practically the same as that devised by Mr. Denison (now Sir Edmund Beckett Denison), and applied by him to the great Westminster clock. The appended illustration is a sectional drawing. Take a steel rod, about 41 inches long, and tap one end for nut A, for about 1 inch with a plate giving 32 threads to the inch. This is for adjusting the length of the pendulum as near as possible to the calculated length—which, for Greenwich, is 39·139 inches long. On the nut rests a collar of brass, C, about 1 inch long, and is free to slide along the rod, but is prevented from turning with the nut by being slotted, a pin being fixed in the rod for the collar to slide in. A groove, or channel, is turned on the top of the collar whilst it is in the lathe, using a lozenge-shaped graver for this purpose. This groove is for the zinc tube (30·5 inches long) to lie in. On the top of the zinc tube is another collar, C2, a facsimile of the lower one, with this exception, it is a little thicker and does not require slotting. It will be seen that these grooves keep the zinc tube in its place, and prevent any friction by its touching the steel rod. Another tube, but of iron, is screwed on to the top collar, C2, which must be large enough (the iron tube) not to touch the zinc tube, having at its lower end fixed on it a collar, B, on which to rest the cylindrical lead bob. The iron tube should be perforated so that the air can freely circulate round the zinc tube. These tubes and the steel rod can only be got from first-class clockmakers, they being specialties. The pendulum is supported preferably on a bracket separate from the movement, the spring S being 2 inches long, clear of chops, ½ inch broad, and $\frac{1}{50}$ inch thick. The lead bob should be truly turned and bored in the lathe. When the pendulum is adjusted to the calculated length, the rate may be decreased by placing small weights on the ledge, C2, this being the place where the addition of any small weight produces the greatest effect. An addition of a weight $\frac{1}{10000}$th of the weight of the pendulum will accelerate it a trifle more than one second per diem. Ordinary eight-day clock pendulums, made of wood, should be well baked, and afterwards saturated in melted paraffin wax; this is preferable to varnishing them."

COMPENSATING PENDULUM.

"Graph" that does not want Washing.

Lalande writes in reply to Arvonia:—"I do not know how to make this 'Graph,' but the following will show where it may be obtained: New preparation for multiplying and copying circulars, letters, price lists, statements, plans, etc.; requires no washing off, and always ready for use. Geo. Stewart and Co., Stationers, 92, *George Street, Edinburgh.*

Lamp for Bath Heater.

M. W. (*Burnley*) states that Hydropathist will find that a Fletcher's Atmospheric Gas Burner, Solid Flame (47), will answer his purpose best, if quantity of water is required, or perhaps the Vapour Bath, described in Vol. III., page 595, will meet his requirements.

Aavonia writes in reply to Hydaopathist:—"You could not possibly make a lamp suitable for this purpose without a lot of trouble and expense, as it reqnires to be made for either gas or oil on scientific prineiples, or it would be a constant trouble and annoyance. You would do far better by purchasing oue of Fletcher's burners for the bath, as they are really first class. His Patent Radial Burner, No. 2, is about the best made, and costs only 4s. 6d. If you wish the water heated previously to entering the bath, then get one of Fletcher's Bath Heaters, price 22s. to 57s. 6d. Write to Mr. Thomas Fletcher, *Warrington*, and ask him to send you a copy of his latest illustrated price list."

A Query for Turners.

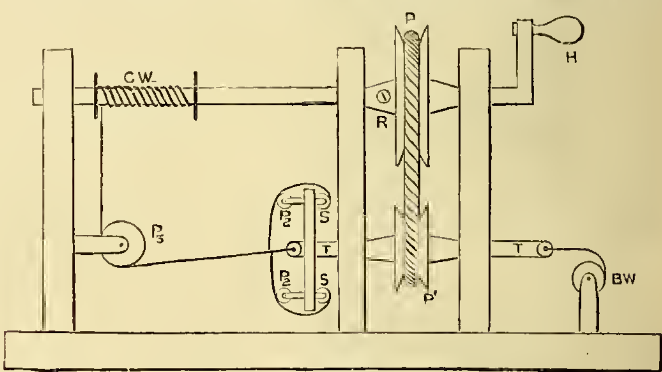
G. C. C. writes, in reply to Enquirer (page 207):—"Oblique, or 'Swash' turning, as it is called, requires a lathe with a *traversing* mandrel, to the left-hand end of which is attached a circular plate or disc, which can be set to any required angle with the axis of rotation of the mandrel by means of an adjustable quadraut at the back of the disc. A fixed standard to the left of this agaiu carries a small revolving wheel or rubber, which presses against the face of the inclined disc, and the mandrel and disc are kept iu contact with the rubber by a strong spriug. As, therefore, the mandrel revolves, it is compelled to advance and recede as guided by the face of the disc, and the work assumes the oblique form Enquirer wishes explained."

Best Chuck for Model Engine Work.

Olla Podrida writes in reply to S. M. L. (*Goderich, Canada*):—"I have found wooden chucks very useful for this class of work. Drive a piece of hard wood—box is best—into a cup chuck, or fix it in a bell chuck, face and recess the wood to suit the work. For turning cylinder covers and small fly wheels, this method is very handy: Cylinder covers for piston rod end, I always bored first, in this way, afterwards turning and finishing them upon a mandrel between the centres; cylinders I used to bore out with a turned piece of wood, having a small cutter let into the end. A capital finish can be obtained if the coring has been done neatly, the flanges were afterwards faced between the centres, cylinder being carried on a mandrel. Eccentrics I always turned upon mandrels, being the easiest way. Have also used solder, but always faced the plate, and recessed it to suit the work, thus avoiding the trouble of setting. Brass or copper plate about one-eighth of an inch thick, and screwed to a wooden face plate. A good deal can also be done with shellac as a fixing medium. A wooden faceplate, large as the lathe will take, in conjunction with brass or wooden clamps and screws, I have also found useful; also, a small nest of drill chucks, say one large one to nose of mandrel, and two or three smaller ones fitting into the large one; these are handy, not only for drills, but for holding wire of sorts. The amount of work that can be got over with wooden chucks is surprising; of course, an independent four-jawed expanding dog chuck is invaluable, but for cheapness, give me wood."

Covering Copper Wires.

Casenhem sends the following suggestions for a Wire-Covering Machine for Flashing Dynamo (page 206):—"The sketch is self-explanatory—cau be made of wood. H, handle for turning pulley; P, and C W, bobbin of covered wire; P is geared with cord strap to smaller pulley, P′, which is fastened on a short length of brass tube, T T, through which the bare wire, B W, passes to P_3, a pulley, and so on to reel, C W. A piece of wood is fixed on the tube, and revolves with the tube. On this wood are two reels of silk, S, or cotton; the thread passes over small pulleys, P_2, and covers the wire. The pulleys, P_2 and P_3, may be common cotton reels. To take off reel, C W, loosen screw, R, and draw handle and axle straight out. C W is wedged on axle."



WIRE-COVERING MACHINE.

Colours for Sketching Entertainments.

D. B. A. writes, in reply to Bert H. (page 207):—"The person to whom you refer as J. W. Binn, when asking for information about colours for sketching entertainments, is, without doubt, Mr. J. Williams Benn, the editor and publisher of 'The Cabinet-Maker and Art Furnisher.' Mr. Benn uses powder colour in calico (?) bags to give the rough groundwork of a sketch, and then finishes up with lumps of colour. I think he uses the ordinary colours sold by oilmen for painters. Possibly he may use crayons, but I think not; to look at, his materials are of the coarsest description. I have called on Mr. Benn, who is a friend of mine, to get the information required by Bert H., but have not been able to see him. I do not think he makes any secret of his *modus operandi*, otherwise I should not write, having had opportunities of going on the platform and examining his work." [The offices of "The Cabinet-Maker and Art Furnisher" are at 5, *Finsbury Square, E.C.*, so Bert H. and others who may be interested in this mode of illustration for lectures, etc., may apply direct to its editor and publisher, Mr. J. Williams Beun.—Ed.]

Varnish for Violins.

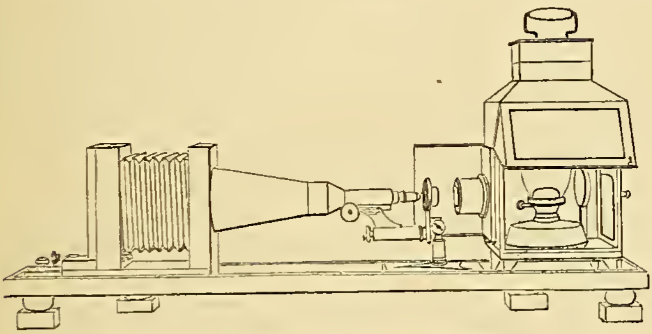
W. F. W. (*Birmingham*) writes, in reply to S. F. C. (*Liverpool*):—"I beg to say the oil varnish I used was Signor Panormo's Transparent Oil Varnish, to be obtained from Mr. C. P. Stannard, 185, *Dalston Lane, Hackney, N.E.*, price 4s. per half-pound can. The spirit varnish I made myself, as per instructions in Amateur Work, with spirits of wine, dragon's blood, copal mastic, and linseed oil, and the gamboge valves for staining, which answers very well, and makes a first-class varnish, but I prefer the oil varnish, as I find the tone of a new violin is not so harsh if varnished with oil varnish, as if done with spirit varnish."

Flute writes:—"From a select parcel of scraped African gum copal, pick out the fine transparent pieces which appear round and pale like drops of crystal; break these small, dry them in the sun or by a very gentle fire. Afterwards, when cool, bruise or pound them into a coarse powder. Then procure some broken bottles or flint glass, and boil the same in soft water and soda. Then bruise it into a coarse powder, like the gum. Boil it a second time, and strain the water from it, washing it with three or four waters that it may be perfectly clean and free from grease or any impurity. Dry it before the fire, or upon a plate; set it in an oven. When it is thoroughly dry, mix 2 lbs. of it with 3 lbs. of powdered copal. After mixing them well, put them into the gum-pot, and fuse the gum. Keep stirring all the time. The glass will prevent the gum from adhering together, so that a very moderate fire will cause the gum to fuse. When it appears sufficiently run, have ready 3 quarts of clarified oil, very hot, to pour in afterwards. Let it boil until it strings freely between the fingers. Begin and mix it rather hotter than if it were for

body varnish, pour in 5 quarts of old turpentine, strain it immediately, and pour it into an open jar or large glass bottle. Expose it to the air and light, but keep it from both sun and wet, until it is of sufficient age for use."

Micro-Photography.

F. W. (*St. Augustine, Florida*) writes:—"Perhaps the accompanying woodcut may help to enlighten H. H. B. (*Reading*). I have not done anything yet in Micro-Photography, but hope to do so." [I have had the cut sent reproduced. It is a representation of the apparatus used in Scovill's Photomicroscopic Equipment, consisting of one Scovill Special Half Plate Camera, one Garbutt's Multum in Parvo Dry Plate Lantern, with Double Condenser, one dozen $4\frac{1}{4}$ by $5\frac{1}{2}$ size B Keystone Plates to make Negatives; also, one dozen $3\frac{1}{2}$ by $4\frac{1}{4}$ size A Plates for Transparencies. Price, complete, 18 dollars (£3 12s.) The presumption is that you are provided with a microscope. If not, we recommend the purchase of one from a regular dealer in microscopical goods. Circular containing directions for use sent with each outfit. I am unable to give Scovill's address.—Ed.]



APPARATUS FOR MICRO-PHOTOGRAPHY.

Water Engine.

G. P. (*Glasgow*) writes:—"Can any reader inform me on the working of the slide valve of a cylinder to be driven by water pressure? I am not sure if it is the same as a cylinder for steam, as steam has an expansion which water has not."

"Salamander" Bath-Heater.

Iona writes:—"Can any one give me any information about a bath-heater called the 'Salamander,' certifying as to its efficiency, and where such, or similar bath-heater may be obtained? The price of the Salamander, I am informed, is £1."

Soap Making at Home.

Iona writes:—"I find the soap made by the process described in Amateur Work too close, and does not lather well. Can any of my brother amateurs give me any information how to make it lather more freely? would the addition of a little fine oatmeal be an improvement? If experiments have been made in this direction by any of your readers, I trust they will communicate the results in an early issue."

INFORMATION SOUGHT.

Measuring Heights of Mountains, etc.

Arvonia writes:—"I am desirous of ascertaining the different heights of several mountains, hills, etc., from sea level. Is there any simple way of doing this? Any apparatus I can make by which, standing on the sea shore I can tell how high a mountain three miles off is?"

Furniture Cream, etc.

L. L. (*Leek*) writes:—"Kindly inform me of a simple and good recipe for furniture cream, also for a paste for cleaning brass and tin articles." [It is possible for me to give you recipes, but I cannot vouch from personal experience for their being *simple and good* ones. I therefore leave it to some of our readers to recommend something on which reliance can be placed.—Ed.]

Electric Gas Lighter.

G. P. (*Glasgow*) writes:—"Can any reader inform me how these electric gas lighters are made? and if one is at liberty to make one for himself? There are a few subscribers in my shop waiting a reply to this."

Boiler for Launch.

C. J. D. writes:—"I am making a small launch engine, ½ inch bore, 1¼ inch stroke. Will any reader tell me the size of boiler I should have, and how to make it? The engine is for a boat 18 inches in length."

Best Motor for Small Lathe.

C. J. D. writes:—"Will any reader of Amateur Work tell me which is the best to drive a small lathe, a steam engine or an electric motor, and the cost of the castings of motor?"

Lathe Castings.

C. J. D. writes:—"Will some amateur tell me how to harden the mandrel and neck of my lathe castings."

Carbon Papers.

C. (*Lisbon*) wishes to know how manifold papers are made, and what kind of paper is used? The recipe supplied by Savoir Faire (page 200) is found to be a long and tedious operation for making a great quantity.

Cabinet for Coins.

R. N. C. asks:—"Will some one give me an idea how to make a cabinet for coins, each coin to be in a separate space, and each tray to hold about 30. Also the names of some fairly cheap book on coins in general and on English coins in particular?"

Bait for Roach and Dace.

R. B. (*Thirsk*) asks:—"Will any reader tell me what is the best bait for roach fishing, and a good bait for dace?"

Creases in Satin.

Esor asks:—"Can anyone tell me the best way to get creases out of satin that has to be painted on?"

Violoncello Making.

S. M. L. (*Goderich, Canada*) asks:—"Will some amateur fiddle-maker kindly give me some information on cello making? I wish to know how the moulds are made, the ribs bent, and thickness of same, size of bass bar (mean). Would be glad to have titles of any treatises on cello manufacture, and by whom published."—[I have submitted your request to Mr. E. H. Allen, who says:—"This would take two days' hard work to answer. I'll do it for you in 1887 if you like. Full up till then." Any reply given must be *very brief*.—Ed.]

Wooden Foot Bridge.

J. C. (*Ireland*) supplements the data already given on this subject by saying that when the river overflows its banks, which is but seldom, the water goes out several perches on both sides, as the ground is partly level. The river does not remain long in that swollen state, but during that time the bridge would be useless.

SALE, PURCHASE, OR EXCHANGE.

Persons availing themselves of this Department of Amateur Work *are requested to note that—*

(1) *No Trade Advertisements can be inserted in this Department, which is open to bonâ fide Amateurs only. The Editor reserves the right of refusing to insert any notice.*

(2) *No charge will be made for the insertion of notices until their number be such as to render it absolutely necessary to do so.*

(3) *Persons writing in reply must forward application under cover to the Editor, in an envelope sealed down, with a Penny Stamp attached in the upper right hand corner, and the* Number *of the notice in the lower left hand corner thus:—*

	STAMP here.
NO. OF NOTICE here.	

(4) *Letters thus marked and enclosed under cover to the Editor will be forwarded immediately to owners of articles for Sale or Exchange, or persons wishing to purchase. No attention will be paid to any communications in which these Rules are not strictly observed.*

(5) *It is desirable that those who reply to notices in this Department should enclose to the advertiser, with their application, a stamped and directed envelope, in order to ensure a reply. When this precaution is not taken, the non-receipt of a reply within reasonable time can only intimate that the article in question is disposed of, or that the proposal made is declined.*

417. Atlas and Book.—(1) Letts' Popular Atlas, Paper Edition, new, published at 42s., price 25s.; (2) Pioneering in S. Brazil, new, published at 24s., price 6s. Will exchange latter for mutilated or dirty set of Amateur Work, Nos. 1—36. (*London, N.*)

418. Portable Horizontal Bar, iron core, all necessary apparatus for erecting in house or garden. Nearly new, cost 34s. No reasonable offer refused. (*London, N.W.*)

419. Books for Sale.—(1) Shakspeare, edited by Samuel Phelps, in 15 Monthly Parts, unbound; (2) First Volume Univer-

sal Instructor, bound; (3) Our Friend the Dog, by Dr. Gordon Staples; (4) Ants and their Ways, by Rev. W. F. White. Wanted, a Book-rest and Pair of Fretwork Frames for Photographs, or would take third of purchase price in cash. (*Bexley.*)

420. **Griffin's Mitre Cutter**, complete. What offers in cash or exchange. (*Exeter.*)

421. **Hand Drill**, good and strong, cost 10s. 6d., nearly new, will exchange for any volume of AMATEUR WORK.

422. **Wood-Working Tools.**—All first-class and nearly new, comprising: 1 17-inch Jack Plane, 3 Chisels, 1 Spokeshave (patent, iron), 1 Brace and Bits, 1 Marking Gauge, 1 Mortise Gauge, 1 Screwdriver, 2 Files, 1 Cutting Pliers, 1 Hand Vice, 3 Bradawls, 1 Bevel, 1 Keyhole Saw, 1 Tenon or Dovetail Saw, 1 Two-foot Rule. Price 21s., carriage paid.

423. **Every Man His Own Mechanic.**—Copy wanted, cheap. (*London, E.C.*)

424. **Amateur Work.**—Wanted, Vols. I. and II., cheap, and in good condition. (*London, S.E.*)

425. **Boy's Own Paper**, Vol. VI., offered in exchange for Vol. I. of AMATEUR WORK, unbound. (*Edinburgh.*)

426. **Organ Pedals, etc.**—For sale, Organ Pedals, 30 notes, and Bourdon Organ Reeds for same, two rows vibrators, percussion action. £3 for the lot. (*Glasgow.*)

427. **Typograph or Cyclostyle**, either, wanted, second-hand, quarto size. (*Ballantrae, N.B.*)

428. **Amateur Work**, Parts 13 to 21, inclusive, wanted. (*Ballantrae, N.B.*)

429. **Books and Serials, Various.**—(1) Cassell's Family Magazine, 3 vols., 1879-81-82; (2) The Quiver, 4 vols., 1881—84; (3) Ladies' Treasury, 7 vols., 1878—84. All unbound and in good condition. Two or three extra Supplements of Ladies' Treasury missing. (4) Stock Keeper, unbound, Vol. IX., complete; Vol. X., 83-84, last three parts missing; Vol. XI., 1884—Part 283 and Index wanted to complete vol. What offers for whole or any part? (*Kettering.*)

430. **Watch and Clock Making.**—Wanted for cash, second-hand books on this subject. (*Brighton.*)

431. **Amateur Work**, Vols. I., II., and III., complete, unbound, offered in exchange for Weaving and Designing in Textile Fabrics, by Thomas Ashenhurst, or any similar work on Weaving and Designing. (*Ossett, Yorks.*)

432. **Six-inch Centre Lathe**, single speed (double cone) mandrel headstock, Britannia Company, never been used; cost £3, will take £2, or exchange for really good Fret Machine. (*Bermondsey.*)

433. **Dubroni's Photographic Apparatus**, No. 1, complete, in oak case, in thorough working order, producing circular picture 1¾ inch in diameter, with printing frame. Requires no dark room. Cost £2, will accept first offer of 15s. (*West Bromwich.*)

434. **Every Man His Own Mechanic.**—13 Parts, complete, uncut, cost 6s. 6d. What offers? (*Durham.*)

435. **Pair of Roller Skates**, fretted metal sole plates, rubber rollers, single in centre, slightly out of repair. Cost 22s., price 5s. (*Rochdale.*)

436. **Fret-Work Patterns**, about 50, first-class. Price 2s. 6d., worth 10s. (*Rochdale.*)

437. **Musical Instruments and Music.**—(1) 60 copies Piano Music, new, 4s.; (2) Sardinian Pipe or Picco, 9d.; (3) Banjo, inlaid mahogany arm, 7 in. scolloped brass rim, screw tighteners, cheap, 5s. (*Rochdale.*)

438. **Amateur Work.**—Wanted, Parts 1—37 inclusive, unbound, clean, and complete. Will give 10s. (*London, E.C.*)

439. **Books on Carpentry, etc.**—(1) Riddell's Carpenter, Joiner, and Hand-railer and (2) Vols. I., II., III., IV. of Design and Work; all bound, perfectly clean, and undamaged. What cash offers for all or part? (*Sunderland.*)

440. **Cottage and Villa Architecture**, by C. Brooks, complete in 36 Parts, unbound, cost 1s. each; each Part contains one Design, with Elevations, Perspective Views, Plans, Sections, and Details, and cost of erection. Will exchange for set of Wood Engraving Tools. (*Cambridge.*)

441. **Joiners' Tools**, of first-class quality, and nearly new.—Plough Plane and 8 Irons, Moving Filister, pair Grooving and Tonguing Planes, movable irons, 3 sizes, Skew Rebate Plane, Smoothing Plane, 2⅝ irons, ½ and ¼ in. Mortise Chisels, Jointer Plane, and Bow Saw. Price 55s. the lot, or will sell singly. (*Norwich.*)

442. **Flower Stand**, strong and substantial, 5 shelves, each 5 feet 6 inches long, supported by turned legs forming handsome addition to any conservatory. Price 20s., free on rail, carefully packed. (*Norwich.*)

443. **Portable Ruling Machine**, 4 feet 8 inches in length; when closed, 2 ft. 8 in.; will rule a sheet 22 in. wide, has two pen slides, and a quantity of pens, ink, etc. Price 60s.

444. **Boy's Own Paper.**—Will exchange any three vols. for Vols. I., II., and III. of AMATEUR WORK, complete, with plates. First three vols. of Boy's Own are in weekly, and the rest in monthly, parts, complete, with plates, etc. (*Driffield.*)

445. **Young Men of Great Britain.**—7 vols., of which 4 are perfectly clean and newly-bound in half-roan, the other 3 not so clean, and bound in cloth. Will exchange for Vols. I., II., III. of AMATEUR WORK, or what offers in cash? (*Manchester.*)

446. **Chemical Cabinet, etc.**—One of Statham's Ten Guinea Cabinets, complete, and as good as new. Also Burette and stand. Offers in cash requested. (*Whitby.*)

447. **Mitchell's Patent Steam Washer**, with stand and gas burner complete. Cost £5 10s., is nearly new, and in perfect condition. Will sell cheap. What offers? (*London, N.*)

448. **Pair of Magic Lanterns**, in good condition, 3½ in. condensers in box, and dissolving apparatus, oxy-calcium light, gas bags, retorts, etc., and about 70 slides. £10. (*Twickenham.*)

449. **Amateur Work**, Vols. I., II., III. Clean, with all the plates. Will sell for 9s. 6d. (*London, S.W.*)

450. **Fret-sawing Machine.**—Wanted to purchase, with Lathe Attachment. Will give reasonable price for machine in thorough good order by good maker. (*London, W.*)

451. **Books for Sale.**—(1) Plumber and Decorator, Illustrated, 10 Monthly Parts, May, 1884, to February, 1885, clean, 3s., cost 5s.; (2) Old and New London, first 4 Parts, clean, 1s. 6d., or Glazier's Diamond in exchange for lot. Purchaser pay carriage. (*Burton-on-Trent.*)

452. **Pansies.**—A large and beautiful collection of most of the best Pansies in cultivation. Warranted true to name. Prices, 3s. 6d., 4s., and 5s. per dozen, free. (*Southwell.*)

453. **Oil Paintings.**—Three, 8½ in. by 6½ in. 5s. each, or will exchange for Guitar, or offers. (*Southwell.*)

454. **Slide Rest**, 8 in., in good order. What offers? (*Perth.*)

455. **Holly Fret Saw**, in good order. What offers? (*Perth.*)

456. **Lapidary's Lathe**, in good order. What offers? (*Perth.*)

457. **Fletcher's Injector Furnace**, 2 lbs. size, with blower complete, in good order. What offers? (*Perth.*)

458. **Prize Holly Fret Machine** for Sale or Exchange. Fret Materials preferred. (*Longton, Staffs.*)

459. **Carpenter and Builder.**—Vols. I. to IX. inclusive, bound, and Vols. VIII. and IX. in numbers, unbound, for Sale or Exchange. Fret Materials preferred. (*Longton, Staffs.*)

460. **Printing Presses.**—(1) No. 1 Self-Inking Model Printing Press and Type, speed over 1,000 per hour. Cost £4 10s., will take £2 10s. (2) Another Press, prints well, speed about 200 per hour. Size 8 by 14 in. Price 8s. (*Shadwell, E.*)

461. **Amateur Work**, from commencement, with all Supplements, wanted. Bound copy preferred. Good books offered in exchange. (*Leicester.*)

462. **Magic Lantern**, gives 5 ft. picture, stands 14 inches high with chimney. Cost when new 21s With many slides, shipping and lever. What offers in cash? (*Braintree.*)

463. **Melodeon**, old and somewhat knocked about. What offers in cash? (*Braintree.*)

464. **Spanish Guitar and Instructions**, 20s. Also the following works for the guitar, in good condition, The Harmonic Union, for guitar and pianoforte, published at 8s; Verini's Instruction for Spanish Guitar, published at 7s. 6d.; Instruction Book by T. B Phipps, published 4s., and 50 Songs, with Accompaniments arranged by B. Luggie, 1s. 6d. May be had separately, or the whole for 10s. (*Hull.*)

465. **Books, Various.**—(1) Newspaper Cuttings Book, 400 pages, paged and index, strongly bound, 3s. 6d.; (2) Leather Case, made specially for holding Supplements of AMATEUR WORK, 2s.; (3) Afar in the Forest, by W. H. G. Kingston (cost 3s. 6d.), 2s.; (4) 20 Monthly Parts Chambers' Journal, 5s.; (5) 13 Parts Cyclopædia of Biblical Geography, Biography, and Natural History (cost 1s. each), for 4s. Purchasers to pay carriage. (*Coatbridge.*)

466. **Instantograph**, ½ plate, in good order, wanted. State price and particulars. (*Coatbridge.*)

467. **Two Brass Cylinders**, each 2 inch bore by 3, and ⅜ in. stroke. Will sell for cash, or exchange for Parts 1 to 30 inclusive, of AMATEUR WORK. Purchaser to pay carriage. (*South Shields.*)

468. **Books, Various.**—(1) Wright's Dictionary Cyclopædia, complete in 37 Parts, published at £3 15s., for 30s; (2) Old and New London, Parts 19 to 30, subscription issue, cost 24s., for 10s. Carriage paid, or will exchange for Photographic Apparatus. (*Edinburgh.*)

469. **Books, Various.**—(1) Cassell's Technical Educator, unbound, 24 Parts at 8d. each, will sell for 10s.; (2) Science Gossip, for 1883, unbound, 12 Numbers at 4d. each, will sell for 2s. 6d. Or what offers? (*London, N.*)

*** **List closed April 8th.**

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List closed April 8th, 1885.

Framework for Proscenium — Ready to receive Canvas and shewing — Method of making and — Joining the Wood.

Working Drawing of Built Proscenium. Designed by Henry L. Benwell.

WITHERBY & Co LITHO 325a, HIGH HOLBORN LONDON, W.C.
WARD, LOCK, AND CO., WARWICK HOUSE, SALISBURY SQUARE, LONDON, E.C.

HOW TO MAKE A TREADLE TOOL-GRINDING AND SETTING MACHINE.

By the Rev. ALGERNON THOROLD, M.A.

I.—EVILS ARISING FROM IMPROPERLY GROUND TOOLS —HOW PLANES SHOULD AND SHOULD NOT BE GROUND.

WELL and neatly-made joints, smooth and true faces on the work, sharp clean finish, combined with satisfaction when the job is complete, depend, first and last, wholly and entirely, upon the state of our tools.

A good workman even will fail if his tools have lost their proper bevel and edge; and there are occasions when the proverb, "A bad workman finds fault with his tools," is not strictly true, for a good and careful worker is naturally always more particular than a bad and slovenly one in what he is handling, and hence much more sensitive and likely to complain than his critics seem to think is his right.

FIG. 1.—PLANE IRON AS IT SHOULD NOT BE.

It is difficult to help laughing outright sometimes, though, of course, it is very rude, as we pay a morning visit to some one or other of our amateur carpenter friends, and watch him at home in his workshop. "He is very clever," we know, and "can make anything;" and so, always being on the look-out for wrinkles, we stop for half an hour to learn.

FIG. 2.—PLANE IRON AS IT SHOULD BE TO BE EFFICIENT.

Being carried away with enthusiasm over the capital papers in AMATEUR WORK on Organ Building, our friend has started hard to build an organ, which is to surprise his friends and neighbours, and add to his reputation.

He is, he says, making C C, but although a little in a fog over the length, not quite understanding whether to work from the upper or lower end of the diapason, his calculations giving different results by about six inches, according to the end at which he begins, he has at last hit upon a measurement which he thinks will do; "for, you know, we can work the other pipes to it," he says, and so the octave will be "sure to come right."

I have arrived at a critical moment. The cap has been fitted on temporarily, and my friend is blowing into C C with all his might, anxious to test the note; for it is explained to me the note does not always come clear at first, and so I find, for C C does not seem very happy this time; it has an uncertain sound. "Is that C C?" I ask, as the production gives out a melancholy buz-z-z-z, as though it had a wheezy cold. My friend says, "It is not quite right, but when the joints are all puttied up, and the lips altered a little, and the stop fitted in properly, and when it is put in its place on the wind chest, it will sound very different; for the wind will then be given with the right force and volume. It is impossible, you know, to blow a large pipe like this properly." The pipe is then put aside for the glue to dry thoroughly, "as it won't do to pull it about much yet," and the small details of fitting and puttying up are deferred.

I express a wish to see a pipe begun, thinking it must be very pleasant to make an organ for oneself; and I soon picture to myself a fine organ erected in my church (for I am a parson—it is well to know each other), instead of a very indifferent "kist o' whistles" now doing duty, and that after a few lessons—for my friend tells me it is soon learnt (he does not know I took my first organ lesson nearly twenty years ago)—I am sitting triumphantly at the manuals astonishing and delighting my parishioners; and I am already thinking of the pardonable pride I shall feel in telling some inquirer of the builder's name—that I made it last winter.

FIG. 3.—COMPARATIVE ANGLES OF IRON PROPERLY AND IMPROPERLY GROUND.

My friend, indeed, is so full in his kind explanations of the diagrams — and I hear it is possible to get an organ builder to set one right sometimes and tune it when finished, and even to procure a few good old pipes cheap, and thoroughly mellowed—that I almost make up my mind to commence active operations on an organ myself. So I begin to look at my friend's wood. "Of course, it must be good sound stuff," I suggest. "Oh, yes," my friend says, "but still if you wish to make it as cheaply as possible, you must make use of what you have first. Now, for instance, this pipe, F sharp—let me see, is this F sharp? I'll try it." "Whe-e-h-h-z," says the pipe.

"No, I think it is A flat. Well, this pipe is made out of the top and bottom of a wine case. With careful management I get two sides out of each piece, and the ends of the box make the smaller parts. Now, that box cost me threepence. I bought several at the same time. Yes, the wood was rather damp, but I soon dried it, and then filled in the shakes and cracks with composition." What sort of composition? "Well, I used putty for this—it will never show when the pipe is stained; but if I had bought the wood at the nearest carpenter's, these pipes would have cost—well, quite two shillings each, which is a consideration when you think how many pipes there are in an organ."

Will I begin a pipe? Oh, certainly! So we go in search of a box. One is found that will "just do," and it is brought in triumphantly. My friend proceeds to take it to pieces, which he does with some judicious blows inside "just to start the nails." "A little rusty!" I observe. "Oh, that's no matter!" At length one side shows signs of yielding, but the nails being longer than we expected—"they always do put in such clumsy nails, you know"—the sides do not part till there are several ominous-looking cracks and splits. It is a little unfortunate, "but some glue run in and some putty for the shakes will make it all sound."

We spend ten minutes in getting out the nails, and then look for the glue-pot, "which can be getting hot while we run the 'jack' over the boards." We both have to look for the glue-pot. Ah, here it is, and I pull it out from behind the stove; the coke box had tumbled over it, but we blow out most of the dust, "and when hot, the rest will sink to the bottom." We then carry it to the kitchen door, with instructions for a little water to be put in, and leaving it to dissolve, we go back and get out the "jack."

My friend places one of the sides of the box on the bench and proceeds to plane it, but the result is not satisfactory; one side of the iron evidently is lower than the other, with the result of leaving deep grooves after each journey over the board, but by no means carrying off a clean shaving, so the iron is tapped to bring it true, but still it refuses to travel smoothly, and leaves ruts and gashes which augur badly for the accuracy of the work.

My friend soon gets very hot, and asks me whether I should mind taking a turn. As I agree, he hands me the plane, and I begin by knocking out the iron. "Ah, yes," says my friend, "you want the hone, I ought to have done that for you—here it is." "Your iron wants grinding," I reply; "the bevel is too sharp in the angle" (see A, Fig. 1). Can we grind it? A very small stone is produced, worked by hand, and well furrowed. I observe to him that we cannot do much with it, and begin to discourse about the advantage of a good stone, and so on, however, as there is no alternative, we do the best we can, and after a time grind down the stumpy bevel and reduce it to something like a true angle; thence we carry it to the hone, which, from bad usage, is lumpy and up and down hill; completing the operation at length, under considerable difficulty. Before we get to work again, however, I tell my friend about a grinding machine I had made to a design, and draw out amongst other things a few sketches of plane irons, both as they should not be, and as they must be for satisfactory work.

These sketches I have reproduced in Figs. 1, 2, and 3. In Fig. 1 is shown a plane iron as it should not be, with the angle of the bevel at A ground too sharp, and wanting the further bevel at C produced by a correct use of the hone. This necessary bevel is shown in Fig. 2, which exhibits the plane iron as it should be, with the angle of the bevel at B ground to a more obtuse angle; giving also the further slight bevel at C produced by the proper use of the hone or buff wheel.

From Fig. 3, which shows at A and B comparative angles of an iron improperly and properly ground, amateurs will be enabled to determine whether or not the plane iron is in proper order in this respect.

But to return to the work which my friend and I had taken in hand. The iron refixed, the jack begins to bite, and though some of the ruts remain, my friend thinks the boards will do for the experiment, but time getting on, and the chisels which we use being in cousin-german condition to the plane, we do not finish the pipe; but as I take leave of my friend, I ask him to look in some morning, that I may show him the grinding machine I had been telling him about, and this he promises to do.

A week or two after I am in my own little shop, when a rap announces a visitor. "Ah, good morning," I say, as my friend of the stumpy tools comes in; "finished the pipe we were at? How does the organ get on?" He explains that he has not done much—has been, in fact, getting his tools in better order; thought he would run round and see my machine, which he thinks is just what he wants himself.

"I am delighted to show it," I reply; "there it is. You see, I can do anything with it in the grinding line." "Set a good edge on too," says my friend, "with that leather wheel, I should think."

In the end, my friend is so pleased with what I show him that he says "He is sure a paper on it would be an immense help to a great many men."

"I shall," he says, laughingly, "write to AMATEUR WORK, and put the Editor down upon you. I have often wanted to know an easy way of keeping my tools in order, and I know there are many in the same plight."

We talk a little more, and he at last goes off, carrying all sorts of measurements, bent upon having a similar machine as soon as he can.

Not long after this, I receive a polite note from the Editor of AMATEUR WORK, asking for a paper on my Grinding Machine, "as it is just the thing for the readers of his magazine." Will I send an account?

I must ask my friend what he means, but in the meanwhile, as I have read AMATEUR WORK from its first issue, and have derived much useful information from its pages, I write to say so, and that I will gladly furnish what is asked, and hope that the readers may find the machine as useful as I have done.

I am the more inclined to do this, after seeing my friend's difficulties with his tools and their almost hopeless order. There may be, too, as my friend says, many who find the working condition of their tools a difficulty; and I do not forget my own past disappointments and embarrassments from the same cause.

Before describing my machine, I will take leave to moralize for a little, and will begin by saying that many of the difficulties which arise in the amateur's workshop are due, not only to carelessness in preparing tools for work, but in afterwards putting the tools away in good order.

I have been into amateur shops where every tool, as required, had to be grubbed for on the floor under the bench, or beneath uncleared shavings and odds and ends of wood. Tools cannot be expected to fulfil their part under such conditions, and the mere fact of such disorder has a detrimental effect on future work, as the amateur well knows the labour in store for him before he can start at all.

As a general and practical rule, it cannot be too often stated that tools should be carefully put back into their respective places after work is over, clean and ready for the next job.

It may seem tiresome to stop in our work half an hour earlier, that we may carry the tools to the stone or the hone, but the time apparently lost in setting and re-setting is most abundantly returned in the comfort we have in always finding what we want in good working condition.

Take what tool you will, and sooner or later each will require careful attention. The saw soon gets blunt, and if left to itself pays us out by tearing the wood and tiring our arms; the plane, the chisel, the gouge, call for greater attention still, and not once, but many times in the day require to be sharpened; even the hammer will sometimes lose its head and the screwdriver its bevel, and from experience, I am well aware that many a slip and rap over the fingers is to be avoided by a regular and careful overhauling of the contents of the rack or chest.

And besides the effect on the tools, habitual want of care re-acts on the character of the amateur himself in his shop. Careless in one point, he after a time grows careless in all, and soon any sort of work passes muster; for bad materials, bad work, bad tools, disorder, dirt, take the little heart out of him he ever had.

I alluded to my own past difficulties in keeping my tools as I felt they ought to be, and I did so incidentally, as those difficulties were, so to speak, the originators of my grinding and setting machine.

Of course, I could, and did, use ordinary grit wheels and hones, but I wanted something which would combine both and always be ready for use, with a maximum of power and a minimum of trouble. I considered the matter for a time, and at length determined to utilise the principle of the itinerant grinder's machine.

The result has fully answered my expectations, and the machine that now stands in my shop is the handiest thing I have.

It will grind tools either on the grit stone or emery wheel, and besides being useful for tools, the emery wheel can be used for reducing any rough surfaces which would spoil the grit stone. The buff wheel both polishes and sets a fine edge on ordinary bench tools, besides being invaluable for the keener edge requisite in carving tools.

Considerable experience has shown me that satisfactory work can only be obtained by using well-kept tools, on good materials, in a clean and orderly shop.

(*To be continued.*)

INDUCTION COILS: HOW TO MAKE THEM.

By GEORGE EDWINSON

THE home manufacture of induction coils is always a fascinating employment to amateur electricians of all ages. Since shocking coils were first brought into public notice, many hundred miles of copper wires have been wound upon reels and left thereon to spoil, after sundry futile attempts on the part of amateurs to construct coils which were intended to give powerful electric shocks to unwary visitors, or send showers of electric sparks from pole to pole. Failure in all cases has resulted from ignorance of or disregard for the most elementary rules which govern the proper construction of such coils. It is well, therefore, at the outset, to study a little the principles underlying the effects sought to be produced by these electric instruments.

I take it for granted that my readers understand

the title of this paper, and know what is meant by an induction coil. I will suppose that all who take an interest in this subject know that induction coils are those little electrical instruments so often seen in the streets and bazaars, with a man or lad attendant, who solicits visitors to try their strength by holding the two brass handles so temptingly displayed on the green baize-covered table. These are the best known form of induction coils, and they bear the popular name of "shocking coils," because they cause shocks or electric tremors to pass through the person who may hold the handles whilst the instruments are at work. A beneficial effect on the human frame has been claimed for those tremors; hence, such instruments as are made to give mild tremors are named "medical coils." I cannot stay to discuss this claim here, but will at once say that if any beneficial effect is to be obtained from electric tremors passed through a human body, an induction coil is preferable to a magneto-electric machine for causing those tremors.

Another form of induction coils familiarly known to the public, are those named "Rhumkorff shocking, or spark coils," so called because invented and introduced to this country by Professor Rhumkorff. Those coils are well and carefully made, and are employed for various purposes beside that of affording amusement to evening parties. When used as a shocking coil for amusement, care should be taken to ascertain the state of health and temperament of each individual before exposing them to its sharp stinging shock, or unpleasant, if not serious, consequences may ensue. A good coil will furnish a juvenile party with much instructive amusement, if employed with a number of vacuum tubes, in displaying electric sparks, in firing small charges of gunpowder, and in lighting gas jets. Such a coil can be easily and cheaply made by an amateur, and I have much pleasure in herewith attempting an illustrated description of the same for the guidance of interested readers.

A Rhumkorff Spark Coil consists essentially of seven parts—viz., core, bobbin, break, condenser, primary wire, secondary wire, and a pair of dischargers. To these may be added for convenience, a base or stand, binding screws for the wire terminals, and a leather cover. I will describe each part and its duty in a separate section.

The Core.—This must be formed of a number of small iron wires, known in tool shops as "binding wire." Cut this wire into lengths of 3 inches, and pack as many as can be in a 2-inch length of $\frac{3}{8}$ inch pipe of any description. Work the ends into an equal length, then proceed to wind some binding wire on the bundle as it is drawn from the tube, until the whole bundle is wound with wire; then allow the bundle to soak in red-hot ashes for an hour or two, to anneal the wires, and cool off the whole slowly. When the bundle is cool enough to handle, unwind the wire, and wind on at the same time a strip of narrow silk ribbon; fasten this off securely with needle and thread, and soak the bundle, thus covered, in some solid paraffin melted in an old saucepan. Take out the bundle with a pair of tongs, and allow the hot paraffin to well drain off into the saucepan, and when again cool enough to handle, file one of the ends true and smooth; it will then be ready to receive the primary wire. The core of the coil will be magnetised by the electric current passing through the primary wire wound upon it, and the magnetised iron wires will be made to attract a small armature fixed on the break of the instrument. Every time the armature is thus attracted the main circuit will be broken, and the armature spring will pull the break back when the magnetic attraction ceases, consequent upon the broken circuit. It is therefore most important that the core be made of perfectly soft iron, easily magnetised and as easily demagnetised.

The Primary Wire.—This is composed of No. 20 silk-covered copper wire wound on the core in two layers. Begin at one end and wind on the wire with the right hand from left to right, and wind each coil closely side by side until the other end is reached; here leave $\frac{1}{4}$ inch of the core uncovered, and wind the second layer of the primary over the first back to the commencing end. Leave $\frac{1}{2}$ inch of this end uncovered, and let it be the end that has been filed true and smooth, then tie the two wires together with a piece of twine, and leave 4 inches of each end free for connections. Over the primary wind another strip of silk ribbon very tightly and neatly, and again soak the whole in melted paraffin. As the primary will perform the double duty of magnetising the core and transmitting the electric throbs of the main circuit by the secondary wire, it is most important that the primary of a spark-coil should have a perfectly insulated covering, be perfectly insulated from the core and the secondary wire, and yet be brought as closely to them as possible, to give them the full benefit of its inductive influence. For this reason I have recommended the use of silk-covered wire, silk ribbon, and melted paraffin, all of them excellent insulators, taking up little space.

The Bobbin, or Reel.—The body of a spark-coil reel is built up of sheets of paper, or of ebonite, tightly and firmly glued to the silk covering of the primary wire, and the bobbin is made up of the tube thus formed and two end pieces of ebonite. The body of the small coil now under consideration may be formed of three layers of good writing paper—such as De La Rue's Imperial Treasury Note—wound on the silk covering of the primary very

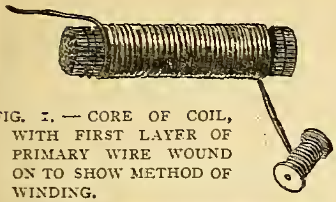


FIG. 1.—CORE OF COIL, WITH FIRST LAYER OF PRIMARY WIRE WOUND ON TO SHOW METHOD OF WINDING.

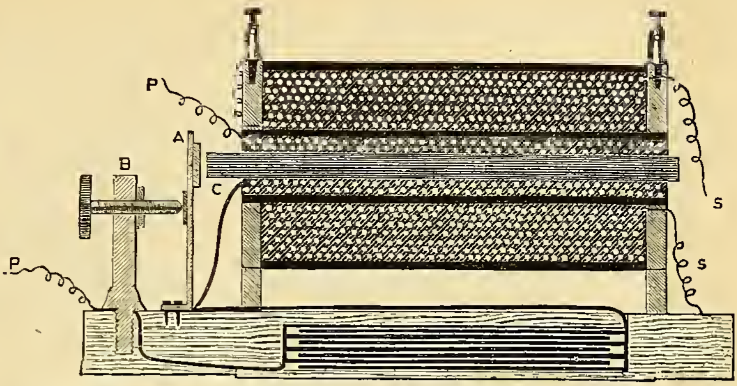


FIG. 2.—SECTIONAL SKETCH OF INDUCTION COIL, SHOWING ALL PARTS. A, Armature and Spring; B, Break Pillar; C, Core; P, Primary Wire; S, Secondary Wire.

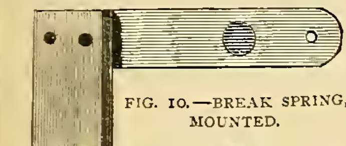


FIG. 10.—BREAK SPRING, MOUNTED.


FIG. 11.—ARMATURE.


FIG. 12. BINDING SCREW.


FIG. 8.—BREAK PILLAR.


FIG. 9.—LOCK-NUT.


FIG. 7.—SPRING OF BREAK.

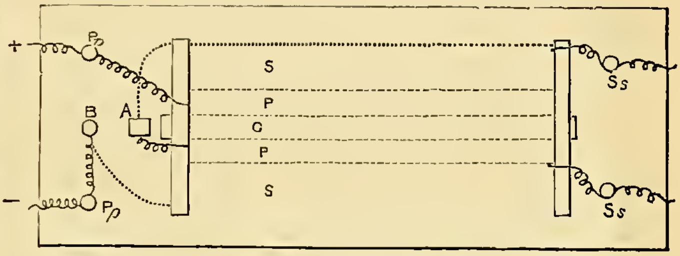


FIG. 13.—PLAN OF COIL ON ITS BASE, SHOWING CONNECTIONS. Dotted lines show track of Wires to Condenser.

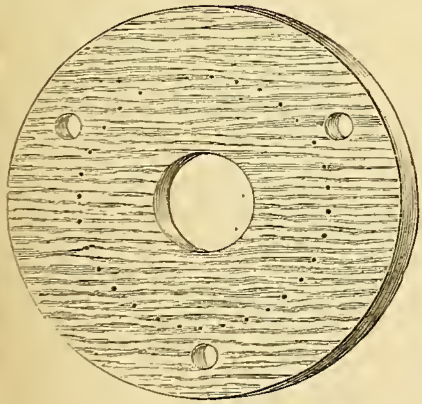


FIG. 4.—WOOD DISC OF COIL-WINDER.

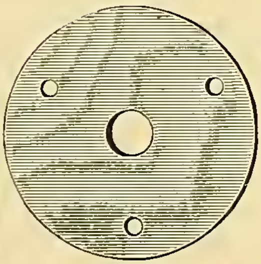


FIG. 3.—METAL DISC OF COIL-WINDER.

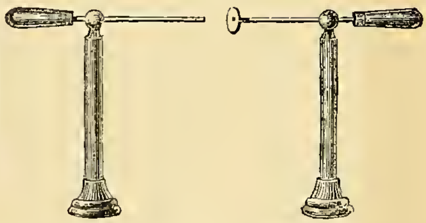


FIG. 14.—PAIR OF DISCHARGERS.


FIG. 5.—SPINDLE OF COIL-WINDER.

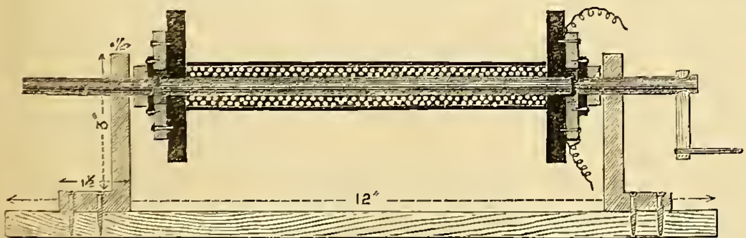


FIG. 6.—SECTIONAL SKETCH OF COIL-WINDER, SHOWING CONSTRUCTION OF THE APPARATUS, WITH COIL IN POSITION FOR WINDING.

REFERENCES TO FIG. 13.

A, Position of Break Spring.

B, Position of Break Pillar.

P, P, Position of Primary Wire.

P*p*, Position of Binding Screws to connect Primary with Battery.

S, S, Secondary Wire.

S*s*, Binding Screws to connect Secondary with Dischargers.

C, Core.

closely, and secured with a coat of good glue between the layers of the paper. The end pieces may be discs, or square pieces of well-seasoned mahogany ¼ inch thick by 1½ inches in diameter; but discs or squares of sheet ebonite of similar dimensions will be found preferable to those of wood. The disc form of bobbin end has a neater appearance than that of a square end, but the latter has the advantage in point of stability, and its use enables the amateur to dispense with a lathe in the work of constructing his coil. I think, however, that the same end may be attained, and the appearance of the finished coil improved by sawing off the corners of the square ends, and thus give them an octagonal form. When the ends have been cut and trimmed up to the required shape, holes must be bored in their centres to fit tightly on the ends of the body, and they must be secured there with a cement of equal parts of pitch and gutta percha melted together, or with some melted marine glue. When the bobbin ends are put on square, there should be at least ½ inch of the prepared smooth end of the core projecting beyond the bobbin, as shown in the sectional sketch, Fig. 2. The bodies of the bobbins of larger spark-coils must be built up of thin sheet ebonite, and the bobbins' ends must also be of ebonite, from ½ inch thick upwards, according to size of coil.

The Secondary Wire.—The secondary wire for this small coil should be 2 oz. of No. 40 silk-covered copper wire in one length, and well insulated. This must be wound on over the primary smoothly and evenly as a reel of cotton is wound, forward and backward in even layers until the wire has been all wound on. This will be found to be a difficult task and a feat almost impossible to be accomplished without a lathe or a winding apparatus specially devised. To meet the possible requirements of amateur coil makers I have devised the winding apparatus shown in section at Fig. 6. It consists simply, as will be seen, of two standards for bearings fixed to a base-board, each standard bearing a short spindle, to which is attached a disc chuck of wood. The spindles and their chucks are made as follows:—Procure two 2 inch lengths of ¼ inch round iron or brass and two discs of sheet iron, or any other sheet metal of the size and substance of a penny; drill or punch a hole in each of the discs, file the ends of the spindles to fit the holes, and rivet the discs to the ends of the spindles. Those amateurs who may have drills, taps, and dies at their command, will, of course, drill two $\frac{3}{16}$ holes in the discs and tap them, they will also cut a thread on each of the spindles, and screw the discs on to the spindles. But, before fitting on the discs it will be advisable to drill the three holes shown in Fig. 3, these are to receive screws to fasten the wooden chucks, Fig. 4, to the discs. Three holes are also drilled in the chucks to receive three screws, and these are used to fix the bobbin in the apparatus. The rest of the apparatus is plainly shown by the figures, and therefore needs no further description. If preferred, the handle on the winding spindle may be omitted and a pulley fixed thereon instead, if it is intended to turn the spindle with a band from a sewing machine, lathe, or other source of rotary motion. The standards may be of wood, iron, or brass, and may be fixed to a portable base of wood, as shown, or they may be fixed to the work-table. The bearings for the spindles should be long, true, and nicely fitted to prevent eccentric or wobbling motion of the bobbin whilst the wire is being wound on; they are made long to allow adjustment lengthwise to admit shorter bobbins without altering the standards, this can be done by backing up the spindle with a few collars. The bobbin is fixed in the winder, as shown (Fig. 6) with the projecting core resting in the recess in the centre of the wooden chuck and the bobbin ends, held by the points of three wood screws passing through the chucks at both ends. Whilst fixed thus, the body of the bobbin should be covered with a thin coat of melted paraffin spread over the paper, and worked well in around the ends of the bobbin.

Before winding on the secondary wire of a spark-coil, it should be well examined for insulation and continuity. The wire for such a small coil as this will only require such examination as can be made whilst running it off from one reel to another; but wires for large coils should be run on to a tin or sheet metal bobbin connected to a battery and galvanometer by means of a spring pressing against the bobbin. The inner end of the wire should be soldered to the bobbin, and every suspicious spot should be tested for continuity by sending a current of electricity through the wire wound on the metal bobbin. If the wire is all right, the needle of the galvanometer will be deflected every time the test is applied, but the deflection will be fainter and fainter as we proceed. If the value of the deflections do not decrease, we may suspect bad insulation, and if they cease we may suspect a broken wire. In this latter case, the flaw must be found, and the wire repaired by unwinding the silk coating to the extent of ½ inch on each end, twisting the ends together, soldering them, and again covering them with silk. Bare places and similar faulty insulation should be, in fact, *must be,* repaired by painting the spots with melted paraffin thinned with a little turpentine.

When the coil-maker is satisfied that his secondary wire is perfect, he may proceed to wind it on from the reel to the coil bobbin in the following manner: Place the reel of wire on a stout knitting needle, and hold this in the left hand. Pass 6 inches of one end of the wire through a small hole made in the bobbin end and

the chuck, coil this into a helix, then proceed to wind on the wire, guiding it on with the left hand, whilst the bobbin is being turned with the right. If the reel of wire is held some 6 or 8 inches from the bobbin, the wire will go on much more freely and kindly than when held close up to the bobbin—in fact, the whole secret of successful secondary winding consists in being able to get the left hand into the knack of allowing itself to be guided by the convolutions of wire as they go on the bobbin, rather than to stubbornly insist upon regulating, or attempting to regulate, the distance of those convolutions.

I have already said that this wire must be wound on just as cotton is wound upon a reel, and this rule must be observed, for confusion will be introduced into the working of the coil if the convolutions are crossed and heaped. If a reel of soft untwisted cotton can be held on the same spindle as the reel of wire, and wound on over the wire at the same time, and this basted with a very thin layer of paraffin and turpentine, it will much assist the winding of one coil on another, and improve the insulation. In building large coils, it is necessary to interpose a layer of thin paraffined paper between each layer of wire. When all the secondary has been wound on, take the free end through the opposite end piece, and coil up a helix as at first. Then soak some tough taper in melted paraffin and put several layers of this, whilst still warm, over the whole outer surface of the secondary, smoothing it down with the hand. Over this place a cover of silk or of purple thin leather, and neatly stitch it to the underside of the coil. The coil is now completed, and should be mounted on a base of mahogany, 6 inches by 3 inches by ¾ inch, neatly planed and polished, before we can determine the position of the break.

The Break.—To get any inductive effects from the secondary wire of a coil, it is necessary that the continuity of the electric current traversing its primary wire should be frequently interrupted, and it is best to have this done with some regularity. Inductive effects may be produced if we attach the tang of a file to one of the binding screws of the primary wire, and draw the wire from the battery over the teeth of the file. They may also be produced by dipping a spiral of thin wire in a small metal cup filled with mercury, the cup being connected with the primary wire and the spiral with the battery. Tubes containing water and called water regulators have all been used as breaks, but all these various forms of breaks must be regarded as makeshifts, whose action at the best is most irregular. The coil now under consideration has been planned with a projecting iron core destined to act as the magnet of a spring break, and this in its many sizes and shapes is the only one deserving attention, since it is easily made, regular in action, and not soon put out of working order.

Spring breaks vary in form and size to suit various sizes of coils. Such a small coil as ours is best worked with a break made up with the parts shown at Figs. 7—11, unless the coil is mounted on stilts on a base, as shown at Fig. 2; then the form of break shown there will be available. The essential parts in all forms consist of a thin flexible brass spring furnished with a small armature of iron, and a contact stud of platinum. The shape of the spring is shown by Fig. 7, the small hole at the top is to receive the tang of the armature, Fig. 11. The two holes at the bottom are for rivets to fasten the spring to its support, as shown at Fig. 10, and the black spot represents the platinum contact stud. The armature may be simply the head of a horse-shoe nail, or the head of a clout fitted into the spring, and riveted fast. The contact stud is best made of a bit of platinum wire also fitted into a hole in the spring, and hammered to represent a rivet head. This spring must be adjusted on its stand in such a manner as to bring the armature level with the centre of the core, and at a distance from it of ⅛ inch, when the support is screwed down to the base of the coil. The springs of larger breaks are also supported at the back with an adjusting screw to regulate the distance of the spring from the core. The next essential part is a contact pillar fitted with an adjusting screw, Fig. 8. This screw must also be tipped with a bit of platinum wire fitted into a hole drilled in the end of the screw.

The size and position of this part is clearly shown in Figs. 2 and 8. It is best to furnish this screw with a lock nut to fix it when the proper adjustment has been secured. When the coil and the parts of the break are all ready, they should be fixed on a baseboard of well-seasoned and polished mahogany or teak, 6 inches by 3 inches by ¾ inch. The bobbin of the coil may be secured to this by small screws passing up from beneath the base, or, if preferred, it may be mounted on a stand or stilts, and these secured to the base by screws.

When all is fixed, connect the wires to binding screws as shown in the plan, Fig. 13, and pass the current from a pint Bunsen or bichromate cell through the primary wire and adjust the break. When the current passes it should magnetise the iron of the core, and this should attract the armature of the spring toward itself. In so doing it will draw away the spring from the point of the contact screw, and thus interrupt the current, consequently the core will lose its magnetism and its hold on the armature, which will then be drawn back by the spring and again be brought into contact with the screw. In an instant the current will again traverse the primary wire, magnetise the core, attract

the armature and break contact, and this action will be repeated with lightning-like rapidity accompanied by a buzzing sound and sparks of pale blue fire from the platinum contacts. Every time the current is thus interrupted, the primary wire gives a sharp kick to the secondary, and each coil of the secondary transfers the compliment to its neighbour until the action (like human quarrels) becomes intensified and breaks out at the ends of the secondary wires in a stream of sparks, if these ends are placed close together. I am, however, claiming too much for this small coil. It is only capable of giving ⅛ inch spark with one cell, or a ¼ inch spark from two cells, and this is the limit of safety with such a small coil, for a higher battery power would burn the insulation of the secondary, and ruin the coil. Such a small coil will not require a condenser, but I will here describe how to make one for the larger coils hereafter mentioned. This coil will, however, administer sharp stinging shocks to persons who may have the temerity to grasp the binding screws to which the secondary wires are attached.

The Condenser.—In mounting and working large coils it has been observed that much fire appears at the break, and even burns the platinum contacts. This shows a waste of power, and to obviate this waste, as also to facilitate the demagnetisation of the core, a condenser is employed in the base of the instrument to absorb part of the charge of electricity at the moment of break of contact, and act as an elastic cushion to the sharp blows of the primary. This condenser is formed of a number of sheets of tinfoil thus arranged. First prepare some sheets of foreign post paper by soaking them in melted paraffin. Lay a sheet of this paper on a table, then spread a sheet of tinfoil smoothly upon it, on this place another sheet of paper, and next a sheet of tinfoil with one of its ends overlapping the lower sheet 1 inch, put on another sheet of paper, then another sheet of tinfoil with its ends fair with those of the first sheet, and thus build up a pile of sheets of tinfoil separated by sheets of paraffined paper, and arranged so that the ends of each alternate sheet may be made to touch each other at both ends of the pile. Then place the pile in in a warm place, and weight it with tiles or flat plates of iron, and thus compress the whole into a book, finally wrap a few sheets of paraffined paper around the whole and bind it with silk thread. The condenser thus prepared must be made to fit into a hollow at the base of the coil, as shown in Fig. 2, and the ends of the tinfoil sheets pressed into close contact with the cleaned ends of two copper wires. These wires are made to form a loop off from the primary circuit, one of them being attached to the base of the contact pillar and the other to the base of the break springs, the method of connecting these wires is shown by the dotted lines on the plan, Fig. 13, and thick lines on the sectional sketch, Fig. 2. The secondary wires of a small coil may be brought down to binding screws on the base, as shown in this figure, but the wires from a large coil should be carried up to two screws mounted on the ends of the bobbin. I have combined both suggestions in the same figure to save space.

The following comparative table of dimensions will, I venture to think, be useful to the amateur coil builder in determining his work :—

TABLE OF DIMENSIONS FOR INDUCTION COILS.

Size of Core.	Size of Bobbin.	Primary.		Secondary.	Condenser.	Spark.	Battery.
In. In.	In. In.	Layers.	No.	No.		In.	Pt. cells.
3 by ⅜	2½ by 1½	2	20	2 oz. 40	None	¼	2
5 by ⅜	4½ by 2	2	20	½ lb. 36	None	½	2
6½ by ½	6 by 3½	2	18	1 lb. 36	50 shts.	1	2
12 by 1½	11½ by 5	2	16	3 lb. 38	80 8 by 6	3	3
16 by 2	15 by 8	2	14	6 lb. 36	100 8 by 6	6	3
20 by 2	19 by 8	2	14	11 lb. 36	150 shts.	12	6

In attempting all coils to give 1 inch sparks and over, very great care and caution must be exercised in winding and in insulating the coils of wire. Thin sheet ebonite and ebonite divisions must take the place of wood and paraffined paper, in addition to a plentiful application of melted paraffin to each coil of wire. The wire must be carefully examined and tested throughout before winding and whilst being wound. I should advise the amateur not to attempt anything above the fourth on the above list, for long spark coils are certainly outside the province of an amateur's skill, and, when made, should be built up in a special manner.

In testing and taking the discharge from coils giving a 1 inch spark and above, it is best to use a pair of dischargers fitted with insulated handles. A sketch is given of a pair at Fig. 14, and these are to be constructed as follows :—Procure two ¼ inch brass rods each 6 inches in length, and fit them with neat handles of ebonite; next get two brass pillars with rounded heads, and bore holes through those heads to exactly fit the brass rods ; then mount those pillars in sockets of hard wood well soaked with paraffin, and fix them in place with shellac ; finally connect the pillars with the secondary wires, and slide the dischargers toward each other until the spark passes between their ends. If one of these ends is flattened we shall get a bushy spark instead of a pointed one.

The space at my command is now exhausted, yet there is much left unsaid respecting the uses to which such coils can be put, and the method of using them. I have also been unable to specify the particulars concerning medical induction coils, but doubtless at some future time I may be enabled to gratify the desires of those readers who may wish to have such coils illustrated and described.

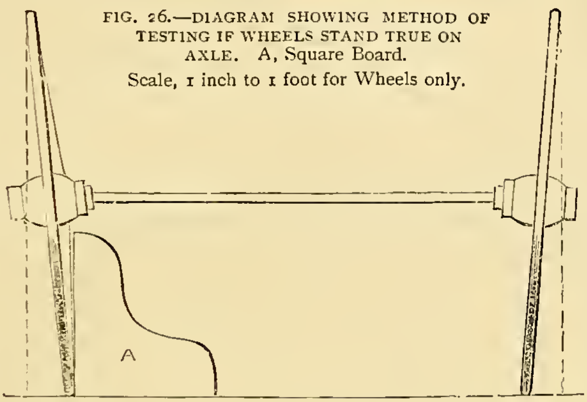
HOW TO MAKE A BERCEAUNETTE PERAMBULATOR.

By A PRACTICAL CARRIAGE BUILDER.

V.—PUTTING ON TYRES AND NAVE HOOPS—AXLES AND BOXES—BOXING WHEELS—DISHING WHEELS BY BENDING AXLE.

THE four wheels finished so far, now for the tyres, nave hoops, and axles, and boxes. And as the tyres must now be made and fixed before the boxes are inserted in the naves for the axles to run in, they must be the first dealt with, so obtain the length for the tyres in the following manner: Supposing your wheels are finished ready for tyring, the lengths can be found by measuring round the outsides of all four rims with tape measure, or a piece of string, adding all four together will of course give the dead length of rims, but to allow for upsetting the ends of each tyre and the thickness of the iron for the same, allow ⅝ inch more on each tyre for every foot the wheel is high; also allow three times the thickness of the iron for each wheel, and this will be found quite sufficient. But suppose the wheels are not made, and the iron warehouse is at an inconvenient distance from your home or district where you live, you may have to make a chance visit in the neighbourhood of the said warehouse, then it would be very handy to have length of tyre bar ready to save an extra journey. Well, the sum total is easily found thus: take a hind wheel and add together three times its height, to which add three times the thickness of the intended iron tyre, then allow ⅝ inch more to every foot the wheel is high, add this to the other products, and that will be the length for one wheel, which, multiplied by two, gives length for the two hind wheels; proceed exactly the same for the front wheels, then add the lengths for front and hind together, and you have the sum total required. Now go to some respectable iron warehouseman and obtain a bar or bars of ½ inch wide of half-round high-backed iron, cut it into four lengths, two for the front and two for hind wheels. Now make one end nearly white hot and quickly pinch in a vice, the hot end projecting about 1½ inch, which strike quickly and steadily with a hammer of about a pound weight, continue hammering until the end becomes much thicker than the other part of the bar; if not thick enough with the first heat, repeat the process until it is nearly twice as thick as bar. Should it bend, or buckle side or edgewise, straighten it out on the anvil immediately previous to each reheating; when thick enough, lay the end on edge of anvil, quite hot as before, and form the end to a short, stumpy bevel, with the bevel on one side only. Now proceed exactly with the other end, only making the stump end with bevel on opposite side, so as to form a splice when the two ends are brought together and these bevels made to overlap each other. This process is called upsetting the ends, and if not done so, the ends when heated for welding together, would become so thin by the necessary hammering to form the union, that they would form a useless joint, and would not stand.

FIG. 26.—DIAGRAM SHOWING METHOD OF TESTING IF WHEELS STAND TRUE ON AXLE. A, Square Board.
Scale, 1 inch to 1 foot for Wheels only.



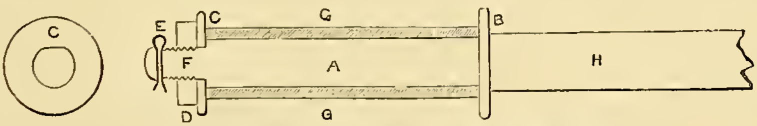


FIG. 25.—LONGITUDINAL SECTION OF AXLE ARM.
A, Axle Arm; B, Collar; C, C, Washer; D, Nut; E, Split Lynch Pin; F, End of Axle turned down and reduced; G, G, Box or Pipe in which Axle Arm fits; H, Part of Axle between Collars. Scale, Half full size.

Now to weld the tyre together, bend it to shape of rim, nearly as possible, with one end overlapping the other, making them spring closely together; and having prepared a hot, clean, and not in the least a green fire, put the intended joint in the middle, and blow up to a white heat, which will be known by the great number of very bright explosive sparks which will issue from top of the fire. At this stage open the fire at top, and carefully, but certainly, throw on the iron a small quantity of clean dry silver sand, which will form a flux, and assist in uniting the two ends. In a minute or so after, draw quickly out of the fire, tap the tyre gently on anvil to remove excess of flux, and then lightly hammer the joint well together, increasing the force of the blows as the iron gets cooler; but in no case strike when the iron is less than

a very bright red heat. Having joined the tyre, lay it on the back of the rim of wheel, which should be placed front down on a board or iron plate, with a hole in the centre large enough to permit the nave to pass through, the rim resting flat down all round on its face. The tyre when laid on as described should be ¼ inch smaller on its inside or flat part than the outside of rim all round. If it is found correct, file or vice up the joint to match other parts of tyre ; if not large enough, make it hot at joint, put a ½ inch hollow tool in anvil, if you have one, put outside of the tyre on tool, and hammer it out larger on the flat side; but if the tyre is altogether too large, it will have to be cut and shut again ; that is, the joint cut, and shortened and welded together as before.

Being now ready for fixing, drill a hole each side of where the joints will come, for a ¾ inch No. 7 wood screw, each hole about 2 inches from the joints, so they will be 4 inches apart, with the joints of rim in centre of each pair of holes, but do not countersink outsides of holes for the heads of screws until after the tyre is put on the wheel, or the tyre will be liable to burst at any one of these holes. Now to fix the tyre: make it a bright red heat all round, moving it round and round in the fire with tongs until it is so. Have the wheel face down on the board or plate mentioned above, and a large can or bucket of water close at hand. Whip the tyre quickly out of the fire, lay it on the back of the wheel, tap it on the rim with light taps of hammer, and when on apply plenty of water ; and note this : do not lose a moment in applying water the instant the tyre is on rim, as it will very soon burn itself loose if not cooled at once. Should the tyre not be put on quite truly, never mind, as it can be knocked up to its proper place after the cooling and before the screws are put into the rim, the holes for which can now be countersunk, and the screws fixed, before which they should be well greased. Now file level any projections of screws on tyre, level off the rims down to the edge of tyres on both sides, file and round off inside edges of felloes, and tops of spokes, and clean all up with glass-paper, and next proceed to put on the nave hoops, for which procure some iron, or, better still, brass pipe, of such internal diameter that it shall drive firmly on to the rebates at backs and fronts of naves turned down to receive them. You will want two of these hoops rather less than 2 inches diameter for the backs of hind wheels, and two 1½ inch diameter for backs of front wheels. These rings can be sawn off the full width, or rather wider than required, and when driven on the naves, secure with three ½ inch No. 7 screws, by drilling holes through the hoops to receive them. Then file down the outer edges to the wood, and slightly round off the outer edges all round. Now at the front or outsides of naves hoops are also required, and many makers and buyers prefer the little thin brass caps, so as to cover up the front entirely. This is a mistake, as the cap must be taken off to oil the axle occasionally, and are then difficult for an amateur to replace ; besides, they are no protection to prevent the naves from splitting during the process of boxing the wheels, the wedging up of which, without hoops, would most likely split the nave in several places, and spoil all your work. Therefore, I strongly advise these hoops to be made and fixed same at front as the back ones, only instead of keeping the outer edges level with the fronts of the nave, leave the hoops themselves to project about ¾ inch beyond, and they can be neatly filled up after being fixed on the axles by corks from pickle bottles, or pieces of wood fitted tightly in ; but the corks are preferable to the wood, as they can be forced in tighter, and prevent the oil from running out much better than wood could do.

The wheels are now ready for boxing (*i.e.*, putting in the boxes or iron pipes in which the arms of the axles rest when the wheels are fixed), but as it is necessary that these boxes (Fig. 25) should be fitted on the axle arms before their insertion into the naves, we must now consider, first, the details of the axles themselves, so proceed thus :—Find the dead lengths of axles, exactly as for the wire wheels already described, between the backs of the corresponding wheels ; mark on a strip of wood, now add at each end 3¼ inches for hind and 2¾ inches for front arms. Now procure a bar of $\frac{9}{16}$ inch square iron, sufficiently long to cut both the axles ; take the piece for hind axle, lay it upon the strip, mark off with a centre punch the position of the collar, and having taken a heat at it, hammer and tool down from this shoulder to the end of the bar until it is reduced to a nice round, nearly parallel arm ; it may taper very slightly to its outer end. Now if you have a lathe, turn down to ½ inch at collar of axle, and a trifle less at the end. Now get enough gas-pipe—iron is best—of ½ inch, or rather less internal diameter, and try if it will make a good fit on the arm when the bore is cleaned out a bit smooth, which can be done with a nearly parallel reamer, or a round file would answer nearly as well. Having procured pipe of the proper size, now finish other end of axle like the first ; now cut off two pieces of the pipe nearly the length of the naves, and fit each on its separate arm ; these are the boxes, and should be ⅜ inch shorter than the naves into which they are put. Proceed the same with front axle, and when fitted all round, get four iron rounds or washers, with holes about ¾ inch diameter, about ⅛ inch thick, and 1¼ inch over whole diameter. File the holes regular, but not large enough to admit the arm.

Make one washer quite hot, force in the small end of arm and drive the washer right up to shoulder of square part, then cool it quickly in water, and the washer, now being the collar, will be firmly fixed in its place. After all are thus served, remount in the lathe and turn the face of washers true with the arms, and round off outer edges. Now turn down end of each axle arm about $\frac{1}{16}$ inch and $\frac{1}{2}$ inch on from the end, and on this turned down part cut a thread and fit a nut $\frac{1}{4}$ inch thick, and at the extreme end of axle drill a hole to receive a split pin. Now file down a flat face the whole length of this reduced portion on its top side when the axle is in position. This flat to be nearly $\frac{1}{4}$ inch wide and slightly inclining upwards towards the arm; now fit a thin brass washer with a corresponding flat to fit the end; this is to be put on next the wheel and does not revolve with it, which prevents the nut from being unscrewed when the wheel is in motion. Having done this to all four arms, we are ready to box the wheels; so now find the centre of each nave and bore a hole straight through it, large enough to admit the box being driven tightly, but not too tightly in; now drive each box in from back of nave, but let it project $\frac{1}{16}$ inch outside the back, and be careful that each box and axle arm have been marked respectively, so that the arms eventually run in the boxes fitted to them. Having driven all the boxes, now fix your hind axle on the bench, inclined upwards at an angle of about 3°, so that the wheel shall not run off during the process of testing if it runs truly, while wedging. Put a drop of oil on the axle and put on the wheel whose box belongs to that arm; now standing on one side of the wheel and looking edgewise across it, revolve the wheel rapidly towards you, if now it runs truly, drive in the wedges in this way (these wedges should be of birch, 1 inch long and $\frac{3}{4}$ inch wide): Drive a very thin chisel into the nave, back and front, about $\frac{1}{4}$ inch from outside of box; take off sharp corners and slightly wet the wedge, insert its end into the cut made by chisel, and gently tap it a little way in; three in front, same at back, in the form of a triangle. Now try wheel on axle, and if it truly revolves, drive home and clean off ends of wedges, if it does not run true, but turns in a wobbling manner, hold a piece of chalk at back of rim while running, and just touch the rim at the extreme point of the wobble, take it off the axle and drive home smartly a wedge, and try again and again, until all run quite true. Now cut out a rebate in front of each nave, large enough to allow the nut and washer before named to be screwed up to the front end of the box, and the process is finished. Now the last operation is setting the axle and wheels true with each other. As these wheels are dished, the arms of the axles must be bent a little downwards, somewhere between the collar of axle and bearing of the springs, so put both wheels on axle and stand them on a level surface, a table will do, and place one spoke in each wheel quite perpendicular from nave to flat surface; fix in this position with scotches each side of each wheel. Now place one edge of a square board on the table (Fig. 26), with its right angle close up to the spoke at the back, and if it tally true with the spoke, it will do. Now try the other wheel, if that be the same, let them remain so; but if the square board touches at top immediately under the nave, and is off at the bottom at the rim, then bend the axle downwards until it and all the others are true and correct.

This, then, is the whole or nearly the whole process of making wheels, axles, and boxes. There are certainly a few more particulars as to carriage wheels, quite unnecessary in a perambulator, and, indeed, these details for a perambulator have expanded to such an extent, that were I not aware of the anxious desire of the Editor of this journal to obtain, if possible, the utmost practical and truthful information on all matters submitted to his care, I should have omitted many details, which of necessity have been herein noticed and explained, with an honest desire to impart useful and practical information. This paper should, according to promise, have concluded the article on How to Make a Berceaunette Perambulator, but I must again beg the indulgence of the readers of AMATEUR WORK to make the hood and the painting and trimming the subjects of another paper, which will conclude the series.

(*To be continued.*)

TYPE-FOUNDING AT HOME.

By J. R.

I.—CONSTRUCTING THE MOULD.

WHEN an amateur turns his attention to printing, he meets with a very serious obstacle at the outset, if he has not a supply of spare cash to lay out on type. A PRACTICAL PRINTER tells us, in page 188, Vol. II., that it takes six pounds of type to set up a piece 4 inches by 3 inches; and a fair sized type would cost 2s. 4d. per lb. Now at that rate a page of notepaper, leaving a margin all round, would cost £1 8s. For my part, I thought that too costly a plaything for me, so I resolved to try my hand at making type, and after many disappointing failures, I at last succeeded in casting a fount, almost, if not entirely equal, to an alphabet of regular type which I got from a printer.

I will now for the benefit of fellow-amateurs, who

may be like minded, endeavour to describe my mould —only I cannot lay down hard and fast rules for its construction, as it is composed of a lot of useless scraps which I picked up from the lumber heap, and if I were to make another, I might not find the same kind of scraps, still I think I would get something else, and work on the same idea. I will, therefore, describe my mould as it is, leaving amateurs to pick up the most convenient materials that they can, and if they discover an improvement, I hope they will give the hint to the readers of AMATEUR WORK, for as we fail to get much information published by practical type-founders, we must try and help ourselves.

In making a mould for the shank of letters, there are three things that must be rigidly complied with—first, each letter must be perfectly true, I mean not wedge, nor diamond shaped ; second, they must be all of one body — that is, to have all the same depth from top to bottom of line : this is easily managed by casting them all in one mould — but then some contrivance is required for altering the thickness, the letter i being on a thin shank while M is on a thick or square one; and, third, the shanks must be exactly of one height, or, as printers would say, type high.

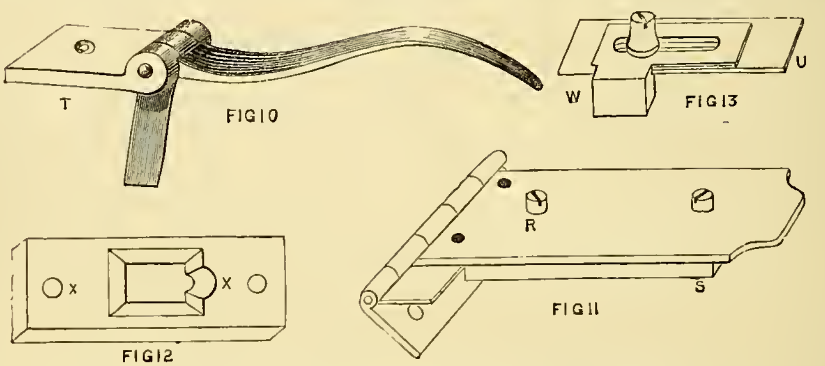


FIG. 10.—SLIDE LEVER FOR TYPE CASTING MACHINE. FIG. 11.—PLATE FORMING MATRIX FLAP. FIG. 12.—DIAGRAM SHOWING HOW SCREWS SHOULD BE PLACED IN BLOCK OR FLAP. FIG. 13.—GAUGE FOR MAKING LETTERS OF PROPER THICKNESS.

I procured from a printer, a set of letters, etc., consisting of capitals, small capitals, small or single letters, figures, points, and spaces—one character of each ; and from these I learned that type height is $\frac{15}{16}$ of an inch, but the square shank is only about $\frac{7}{8}$ inch, and this is the length of the mould proper, as the other $\frac{1}{16}$ inch is formed in the matrix, for we have as it were two moulds—one for the shank and another for the face, or character that is to be cast.

I got three pieces of sheet brass, about $\frac{1}{16}$ inch thick, fully $\frac{7}{8}$ inch broad, be sure you have plenty of breadth, you can dress down to size—these pieces are shown in section, A, B, C, Fig. 1 ; B and C forms a dovetail slide, Fig. 2 and 3, shows its construction ; E, F, G, are three pieces of brass, I sawed mine out of a brass bolt, with a piece of watch main spring, rather a laborious process (Fig. 4 will show how I cut them), but something more handy may be got, only that something must be very carefully dealt with, for very much depends on its adjustment ; file up the pieces, F, G, true, take care and not rock the file, as that carries away the edges, leaving the middle high. But I would here hazard a suggestion which no doubt will be pooh-poohed by adepts, still it may help the unpractised —place the point of the file firmly against a table or other support, pressing the handle with your breast ; take the piece that has been filed nearly to size, between the fingers and thumb of each hand, and draw it from point to handle with a firm level pressure, having the idea that you want to make the centre hollow, and you may find you can make it more true this way than working the file on it ; and I may add, for particular parts, always use a sharp file, for no one could make a good job with a blunt file. The file that I used is called a circular saw file, about 1 inch broad by 8 inches long, costing about 8d. ; they are pretty fine struck, and answer very well. Having the pieces F, G dressed as Fig. 2, you then form the other piece like E, and when sure that it is the same shape and size from end to end, you take the piece F and lay it on the plate B, and clutch it with a hand-vice, and with a bow drill bore the two holes shown black, countersink them a little on both sides, and rivet them firm, taking care not to damage the pieces with the hammer in doing so, then introduce E, and lay G on as Fig. 2, fix it in the hand-vice, bore and put in the black rivets the same as the other side, and see that they are kept in close contact, so that E will require a good push to remove it, then draw file the plate side till all marks of the riveting are taken out and all level.

We then take two blocks of brass, $\frac{3}{4}$ inch by $\frac{7}{8}$ inch, and a little thicker than the body of the letter to be cast—it is shown at H, Fig. 4, and Fig. 5, file one edge square, and lay it square across the plate ; and you cannot be too careful of this part, for if the edge of the block does not rise square from the plate, the type will be diamond shaped, and will not stand in line, or if the block does not stand square across the plate, the type will be wedge shaped, and equally worthless ; but

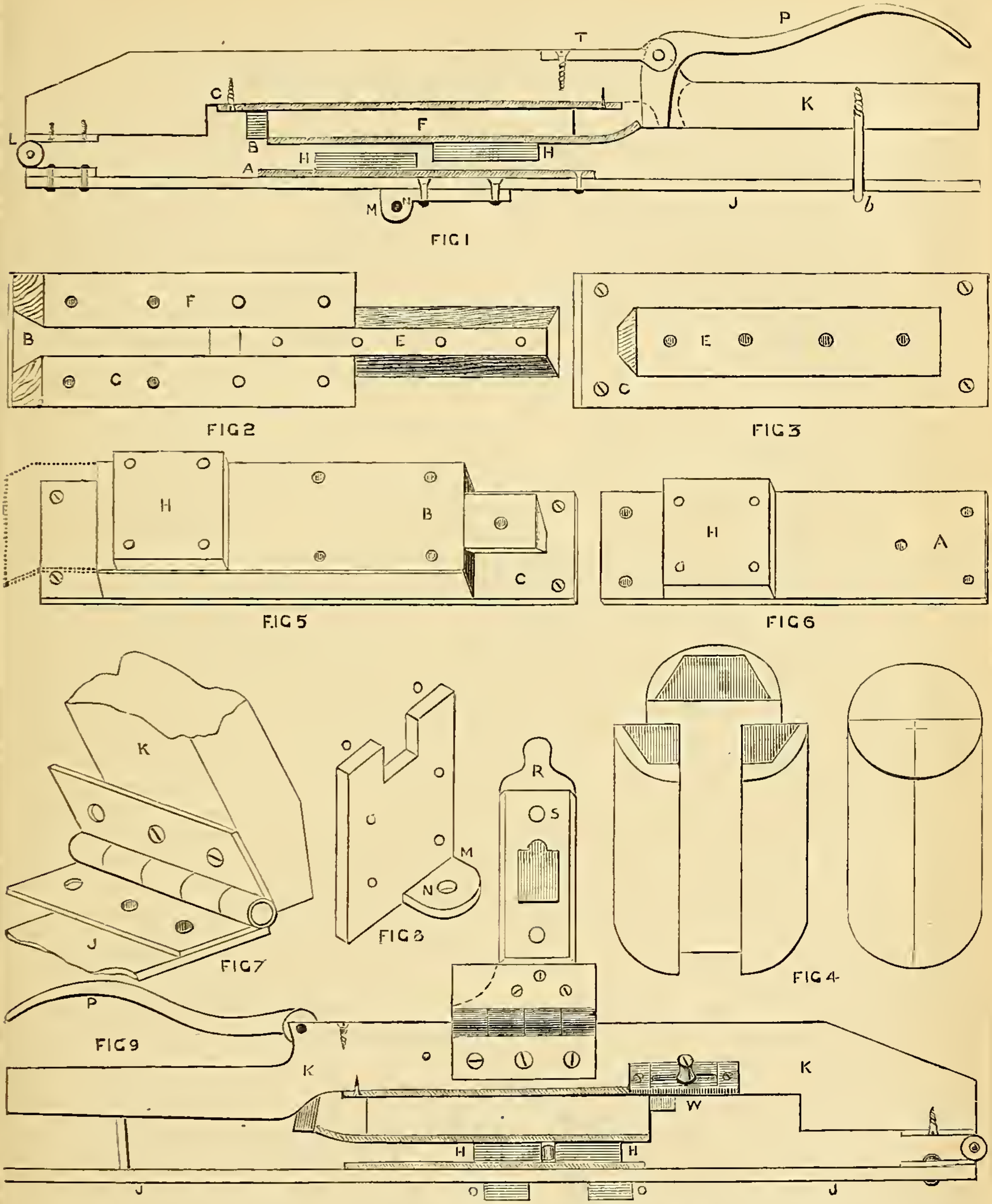


FIG. 1.—SECTION OF MOULD, UPPER SIDE, LEFT SLIGHTLY OPEN TO SHOW HOW SHANK BLOCKS ARE FIXED. H, H, Shank Box; F, Slide; J, K, Sides of Frame; P, Slide Lever; *b*, Steady Pin; M, Clamp for Fixing on Funnel; N, Hole for Hinge Pin. FIG. 2.—DOVETAIL SLIDE. FIG. 3.—REVERSE VIEW OF SLIDE. FIG. 4.—DIAGRAM, SHOWING PROCESS OF CUTTING UP BRASS BOLT. FIG. 5.—SLIDE PLATE WITH BLOCK FIXED TO IT. FIG. 6.—PLATE TO CARRY CORRESPONDING BLOCK. FIG. 7.—HINGE. FIG. 8.—PLATE SERVING AS GUIDE FOR MATRIX FLAP. FIG. 9.—SECTION OF MOULD, LOWER SIDE, SHOWING MATRIX FLAP RAISED.

having made sure that all is right, you fix it firmly in the vice and drill the four holes marked light, Fig. 2, right through the slide blocks plate, and letter block, H, countersink and rivet as before. Now carefully dress down the block H, to exactly the thickness of the body of type intended to be cast. Strip of all roughness caused by the riveting on the slide blocks F G, and this part is finished.

Next rivet E on to plate C, Fig. 3, and having dressed off the rivet heads, push it into the slide, and it will have the appearance of Fig. 5. I forgot to say that my slide is 2 inches long, and the dovetail blocks are $\frac{3}{16}$ of an inch thick, less might do, but I think it is better to have a good bearing. We now rivet the other block H on to plate A, Fig. 6, taking the same care of keeping square as with the other block, and having dressed it down to the same thickness, we lay them aside till we get ready a frame to fix them in. J, Fig. 1, is a strip of iron 11 inches long, $\frac{5}{8}$ inch broad, and $\frac{1}{16}$ inch thick; mine had done duty as the bow of a frying pan, and I could wish nothing better. The other side, K, is made of some hard wood not liable to warp with heat. I got a piece of mahogany, a bit of a broken chair, I think, 11 inches long, $1\frac{3}{4}$ inch broad, and $\frac{5}{8}$ inch thick, next get a strong well fitted hinge L, Fig. 1 (a loose rickety one will not do), and though it be $1\frac{1}{4}$ inch, it will make no difference, of course, you can only use two screws for fastening it to the wood, but that will be quite sufficient, and the extra length of joint will make it more firm. Fig. 7 will show what I mean. This does not look very well, but we cannot sacrifice utility for appearance, and except we get a specially made hinge, it would not do, for a common $\frac{5}{8}$ inch hinge is too light, or we could make J and K swell out $\frac{1}{2}$ inch at the ends, but it is more difficult to finish up when they are not straight. We will commence our frame by filing the end of J square, and riveting the hinge as at L, Figs. 1 and 7, then get a piece of iron or brass like Fig. 8; it must be $\frac{1}{8}$ inch thick, $1\frac{1}{2}$ inch high, the breadth is not particular; it must have a knee, M, turned at one end, see also M, Fig. 1, with a hole drilled to bolt on the funnel, and on the other end a notch is cut out, the two sides O, O, serving for guiding pins for the matrix flap R, Fig. 9; having this done, we place it on J, Fig. 1, with $4\frac{1}{2}$ inches between the hole N and the centre of hinge—see that the notch is deep enough; then fix it in the vice and drill the four holes, countersink a little on the inside of J, and rivet firmly, smooth up the inside after riveting, and lay on the plate A, Fig. 6, as shown at Fig. 1, keeping the shank block H $\frac{3}{8}$ of an inch behind the hole N; try if it lies flat, then rivet it on; this being done we take Fig. 1, and closing the hinge lay it down alongside K in its place, same as Fig. 1, then take the slide, Fig. 5, and mark how much you need to cut out of the wood to make the frame close properly; remove the wood carefully so as to have the bottom of the cut perfectly square and level, that when the hinge is fixed, and the frame closed, the shank blocks H will strike equally at top and bottom. We must now put in the slide lever P, Fig. 1. I got a 5 inch nail and making it red hot, I hammered the head down a little, and bent it like Fig 10, and having drilled a hole through it, I riveted it into T. I think Fig. 10 will make this part plain. We can cut away part of K, at the back where it is fixed, it will make the frame more easily grasped, and give more play to the tail of the lever, then cut a mortise right through K for the point of the lever to work, and fix T to the back with a screw; some arrangement for making it push the slide must be made. I put on a sliding bar, but I think if the plate B were extended back till it meets the point of the lever, it would do as well, and be less trouble to make; the end of the plate may perhaps require to be bent a little to cause it to come in contact. This, I think, will be understood by referring to Figs. 1 and 5, the dotted line showing the plate B extended, then drill a hole through J at B, Fig. 1, to take a good sized wood screw, say $1\frac{3}{4}$ inch, about 2 inches from the end.

We are ready now for fixing up; screw on the hinge L to K, and see that it lies parallel with J, then mark through the hole B where to put in the screw for steady pin, and getting it in firm cut off its head and bend it a little towards the hinge to suit the circle of opening, round up the head to make it take the hole freely; then take the slide, Fig. 5, fasten it to its place with four screws, and see that the blocks H, H will push close together, and will open the wideness of at least three ems, likewise that the lever P has perfect control of closing them; this being so, push the mould close and tie a piece of cord round it at B to keep it close, then take the file and dress the bottom as level as you can, the two guiding pins O, O will be somewhat in your way; but if you get it right as far as the matrix covers, it will do. Now turn the mould over and apply the file to the upper side, filing off wood, brass, and iron, till it is exactly the height of the shank of a letter, try in a letter as shown at Fig. 9, and file down till the letter, and no more, projects out of the mould. As I said before there is about $\frac{1}{16}$ inch taken up by the letter, that is, a type is about a $\frac{1}{16}$ of an inch higher than its shank, so when we have our mould dressed down to shank height—this sixteenth will be standing out ready to make an impression in the matrix. We now commence the matrix: get a piece of iron or brass—I prefer brass because it is more easy to work—$2\frac{1}{2}$ inches long, $\frac{5}{8}$ inch broad, and fully $\frac{1}{8}$ inch thick, R, Fig. 11; this is what we may call the matrix flap. Rivet this flap on to a nice fitted hinge as at R, and it will be better to use a $1\frac{1}{2}$ inch brass hinge here, for it is of importance

that there be no shake, so that the matrix may always fall in the same place; of course, the guide pins will help to keep it steady, but we cannot be too careful of this part. We must now prepare the matrix box, Fig. 12: it is a block of brass $1\frac{1}{2}$ inch long, fully $\frac{1}{2}$ inch broad and $\frac{3}{16}$ inch thick; lay it on the flap, one end close to the hinge, fix them in the hand-vice, and drill the two holes marked + right through, do not cut out the square hole at this time as we cannot be sure of its place till all is fixed up. We now require two screws, Fig. 11, and if we have not a screw plate and taps, we must apply to a jobbing blacksmith who will make two screws, and tap the two holes in the block; Fig. 12 will show how they are placed. The screws may be made with a slit to turn with a screw-driver, or the heads may be flattened and turned like a fiddle pin, or they may be squared, and turned with an alarm clock key; having got the screws ready, we screw the block on to the flap, Fig. 11, having first opened the holes in the flap a little to allow the screws to pass, then take the mould and push back the slide till there is about the wideness of two ems between the shank blocks, lay down the hinge on K so that the opening between H, H will be in the middle of S, mark it there, and turning up the flap screw the hinge to K, as shown at Fig. 9; now fit the other end of the flap between the guide pins O, O, and try and make it a fit all the way down. The points may be opened a little to make the flap take, but it should be as tight as it will work; this is of great importance, for if the matrix does not always fall in the same place, some of the letters will not be fair on their shank. We have next the gauge for making the letters the proper thickness; we require a screw the same as the two used for the matrix flap, Fig. 13 shows it. U is a strip of iron, it may be $\frac{5}{8}$ inch broad and 2 inches long, a hole is drilled and tapped in the middle of it, and a hole in each end drilled and countersunk to take in two small wood screws to fasten it to K at W, Fig. 9; W is a piece with a knee bent down at right angles, this knee forms the stop, it has a slit cut on its upper side about $\frac{1}{2}$ inch long, and wide enough to slide on the neck of the screw. I think Fig. 13 will make its construction understood; U would be better to be sunk its own depth in K, and so placed that when the blocks H H are close together, the slit will be at its extremity, but when the slide is pushed back, it will follow up, and on pinching down the screw the knee will prevent the slide closing again, by coming in contact with the dove-tail block. We may now before leaving this side of the mould, cut out the square hole in the matrix box S, push back the slide the wideness of two ems, and turn down the flap with the matrix box screwed on to it, mark where the hole in mould lies on the box S, then take it off the flap, and making this mark the centre, drill a hole through it; we can countersink it on the upper side till it is little more than $\frac{1}{16}$ inch from being through at the edges on the upper side, then with a small file cut it out square, always keeping the upper side much wider than the under side, see Fig. 12. We run in a notch at + with a half-round file or three-cornered one, this is for register when putting in the matrix. When this hole is finished, it should do more than clear the shank hole of the mould all round, *i.e.*, when the matrix is put in a little, it will more than cover the space between H, H. We have now the mould finished, and with it the most particular part of the work.

In another short paper I shall describe the funnel and the arrangement for cutting the type, also forming the matrix, with some of my plans for finishing the type.

(*To be continued*).

MY FURNITURE, AND HOW I MADE IT.

By MARK MALLET.

IV.—MY BEDROOM CHAIR.

THE construction of a chair is generally a task which presents serious obstacles to the amateur workman. Apart from any demands that it may have to be ornamental in appearance, it has certain practical requirements which must not be lost sight of—it must be comfortable to sit upon, it must be strong, and it must be light to move. With all these requirements the unskilled worker finds it no easy matter to comply. As a rule, therefore, he does well to leave chair-making alone till he has become a thorough master of his tools by practice in other matters. But bedroom chairs may be said in some sort to form an exception to the rule. To be sat upon is not their chief use, and they have little of the hard wear and tear to which living-room chairs are exposed. We need not fear but that we can build a bedroom chair which will prove sufficient for its purpose. That shown in Fig. 28 will match with our other articles of bedroom furniture, and will give us no great difficulties in the making. Its height in the seat is 1 foot 5 inches, its height to top of back 3 feet, and its seat is 14 inches square.

To make it, we must first cut a piece of inch board for the seat, 13 inches square. This board is drawn in Fig. 29, on the two inch scale; the same scale, it may be observed, is kept in all the other working drawings which refer to this chair. From each corner of the board a square inch has to be sawn away as shown in the diagram. The dotted lines mark the outlines of the legs.

The front legs, as well as those pieces which form

the hind legs and the sides of the back, are also to be of one inch stuff. Fig. 30 is a working drawing of a front leg seen from the side. It is 2 inches wide above, and tapers at the bottom to one inch. The top will be seen to be so cut as to form a shoulder to support the seat, and when fixed, to fit into the corner of the seat-board, and to be flush with its sides. The way in which it is finished is shown in Fig. 30 ; also, in the elevations, Figs. 32 and 33. It is to be fixed by two screws into the seat-board, and also by a screw through the seat-board into the shoulder. Care must be taken in driving these screws not to put them in the way of the ornamental screws which will be added later on, and the positions of which are plainly shown in each of the two last-named figures.

One of the pieces forming the hind legs and sides of back is shown in Fig. 31. At that point near its centre where it is to be attached to the seat, it is 3 inches across. At the top it is 2 inches wide, and 1½ inch at the bottom. From the dotted lines it will be seen that such a piece will cut into a board 3 feet long by 6 inches wide. Two may, however, be equally well cut from a 9 inch breadth ; and as one such piece alone will never be wanted, it will be well so to economize timber. If a set of chairs, say three, is to be made, a still further saving may be effected by using 12 inch board, two lengths of which will cut the whole six pieces required. The manner in which this piece is cut to receive the seat-board is shown at A in the illustration. The dotted lines at B show the extent of the seat-board backwards. In the upper part, two mortises, C, C, are made to receive the ends of the cross-pieces of the back. They are two inches long by half an inch broad. The centre of the upper mortise is 5 inches from the top, that of the lower is 13½ inches from the same point.

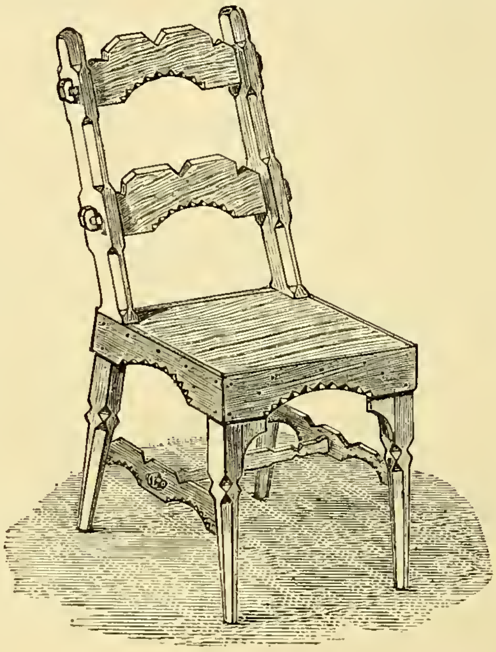


FIG. 28.—CHAIR FOR BEDROOM.

One of the cross-pieces of the back, to secure which these mortises are intended, is shown in Fig. 34. These pieces are of half-inch stuff, 4 inches wide, and 15 inches in total length. The length from tenon to tenon, that is, the distance between the two side-pieces, is 11 inches. The tenons are made to project an inch beyond the side-pieces, and the holes are shown through which they are to be secured by pegs. These holes are semicircular in form.

To strengthen the legs, and to tie them firmly together, three spars are used. One of the two cross spars is figured at A, Fig. 33. It is a strip of half-inch wood, 15¾ inches long and 2½ inches broad. It will be seen to be pierced in the middle by a mortise, 1½ inch by ¾ of an inch, for the tenon of the central spar. It passes *within* the legs to the distance indicated by the dotted lines at A, A, that is to say, it comes so far as to the bevels of the legs. It is screwed into the legs at each end with a couple of three-quarter inch round-headed screws, as may be seen by looking at the parts lettered C, C, Fig. 32.

In Fig. 35 we have the central spar. This is cut from a strip of three-quarter inch board, 13 inches by 2 inches. Its length from cross spar to cross spar is 10 inches. The tenons by which its ends are mortised through the cross-pieces, and the holes through which they are pegged on the outer side, are shown. The ends of the tenons project beyond the cross-pieces the distance of one inch.

Two small angle-pieces, which help to support the seat and to strengthen the front legs inwards, will be seen marked D, D, Fig. 32. They are of three-quarter inch wood, and measure 6 inches by 2 inches. Each is shown as if fixed to the leg by one large round-headed screw at bottom, but it is also held in place by a concealed two inch screw driven through the leg near its top, and by another driven downwards through the seat-board.

Since we do not demand that our chair shall form a luxurious seat we do not propose to pad it—a cushion can be used if needed. We merely propose to cover the board which forms its seat, with American leather cloth, which will match the coverings of our other pieces of bedroom furniture. This is to be stretched over it in the same manner as on previous occasions, and no great neatness will be needed as regards the edges, since we shall have abundant means of hiding them. This will be done at the front and sides, by the pieces marked B, in Fig. 32, and C, in Fig. 33, and at the back a narrower strip, say, 1½ inches wide, will suffice. These pieces are of

half-inch board, and the upper outside edge of each should be neatly and smoothly rounded off. They are to be fixed in place, as shown in the diagram, by round-headed screws, ornamentally arranged. They are of material use in strengthening and binding together the whole chair, and imparting as much rigidity as possible to the entire fabric.

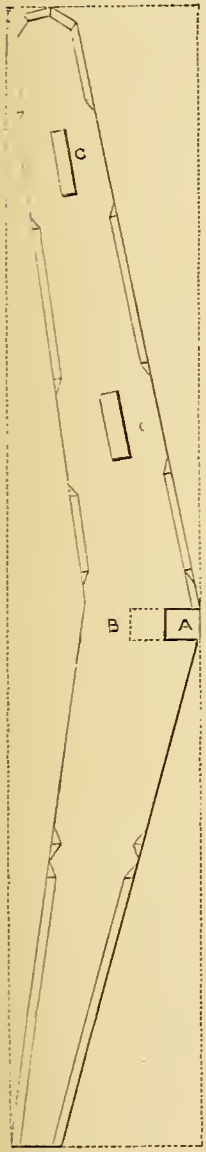


FIG. 31.—SIDE VIEW OF HIND LEG AND BACK PIECE.

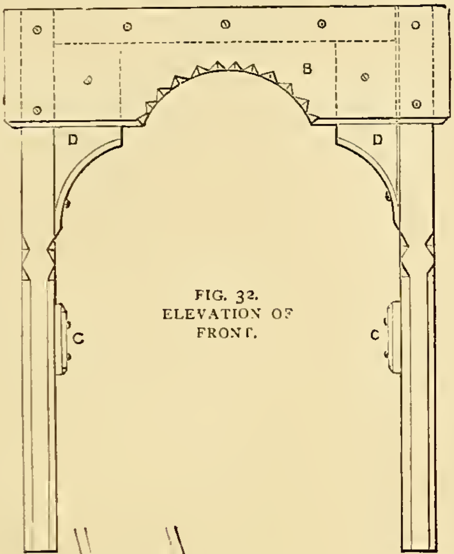


FIG. 32. ELEVATION OF FRONT.

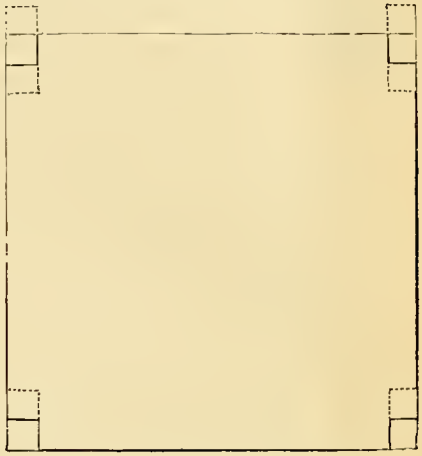


FIG. 29.—PLAN OF SEAT OF CHAIR.

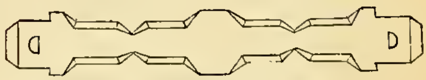


FIG. 35.—CENTRAL SPAR.

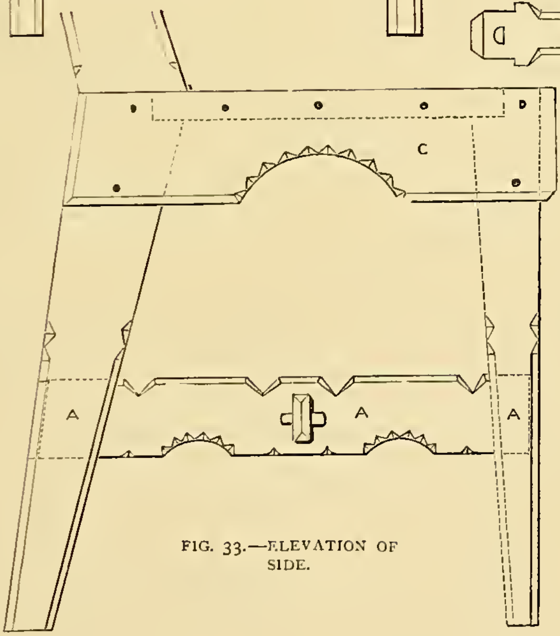


FIG. 33.—ELEVATION OF SIDE.

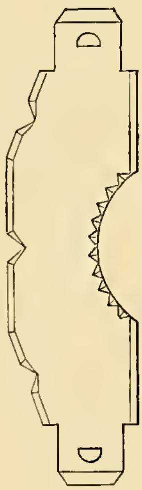


FIG. 34.—CROSS PIECE OF BACK.

FIG. 30.—SIDE VIEW OF FRONT LEG.

A lighter chair, and strong enough for most bedroom purposes, might be made by working on the plans above laid down, but using three-quarter instead of inch board for the seat, legs, etc. Yet, as strength and solidity are desiderata in any article of furniture that is meant for use and not for show, it is, I think, better to make use of the thicker wood, and especially for the legs, even if the thinner material be adopted for the other parts. At least, a couple of these chairs will be required for the equipment of the bedroom, and in some, perhaps, as many as three or four will be found necessary. Practice, however, helps mightily in this as in other kinds of work, and when the amateur has once succeeded in making his first chair, he will find himself able to turn out the rest far more quickly.

(*To be continued.*)

THE DRILLING FRAME AND ECCENTRIC CUTTER.

By JAMES LUKIN.

THESE, with the eccentric chuck, will supply the means of very high class ornamental turning, and are at the same time the cheapest and simplest of the lathe apparatus used for that kind of work. One of the best turners I ever knew had the following only, and a visit to his drawing-room was a rich treat, as his work in hardwood and ivory, on mantel, bracket, or in cabinets, was most artistic in design and very beautifully executed. The lathe was a 5 inch centre by Holtzapffel, but had not the traversing mandrel; it was fitted with division plate and index, a good plain slide-rest, drilling frame, eccentric chuck and eccentric cutter, with a dozen or two of drills and tools and goniometer for sharpening them, *et voila tout*. Such an outfit is about the minimum for ornamental turning, but is a perfectly satisfactory one. Of course it cost money, because Holtzapffel does not give away his lathes, but they are as perfect and reliable as it is possible to make them, and are always marketable. This, however, is perhaps poor consolation to those of our readers who are only able to go to cheaper makers, and have to put up with lathes which do not bear a similar character for extreme accuracy and exquisite workmanship; and we must try to meet the requirements of this very numerous class of amateurs.

How far it is possible to construct home-made apparatus of fairly good quality which will enable work to be done that will pass muster, is a question which depends for its answer upon the skill of the workman; but with ordinary care and patience a very good drilling frame and eccentric cutter are within the powers of many of our readers. The difficulty is to fit the spindle to its *hard* steel collars so that it shall run quite freely, yet without the least suspicion of looseness or shake. To construct this piece of apparatus, as now made, it will be necessary to obtain a square bar of iron or steel, 4 inches long and $\frac{5}{8}$ inch each way, which will allow $\frac{1}{16}$ inch to be wasted in filing up to exactly $\frac{9}{16}$ inch square. A 5 inch will be a little better, but 4 inches in length is quite enough for general work, and this will also be found a sufficient task in the way of accurate drilling. The only object of increased length is to give a wider space between the collars, which adds slightly to the steady running of the spindle. I have, however, seen some very good ones of only 3 inches in length, and if the amateur is inclined to try a short one first, he will find it capable of plenty of hard work, and may perhaps be found sufficient for his requirements. It is, of course, rather easier to square up and drill a short shank than a long one.

The filing, squaring, and outward shaping of the bar, are operations already many times described, and need not here be repeated. Scraping, necessary as it may be deemed by makers of high class apparatus, is not required, as draw-filing will amply suffice, and has its advantages in preventing such a tool from slipping under the clamps which secure it in the receptacle of the rest. It may, of course, however, be polished in the usual way if preferred. After roughly squaring this bar with a bastard file, prick centres as accurately as possible at each end by means of diagonal lines, drill them and mount the bar in the lathe with a carrier at one end, and with the slide-rest tool take a light cut all along it so as just to obliterate the angles, and also take a little off the ends, and neatly round off the corners. This operation will enable you to correct the squaring up of the bar as the obliterated angles must be just renewed by subsequent filing. The outside edges and sides will thus be equidistant respectively from the drilled centres, and it will not matter, when the drill stock is laid in the tool receptacle, which side chances to be uppermost, or which side you drill for the oil holes. Apart, however, from this and the workmanlike appearance, it is not of such great importance whether the bar be accurately square if the same side is always placed below, so that at the axis of the drill's rotation shall be truly concentric with that of the mandrel. This it is to be remembered is *the* essential.

The next job is to drill this square bar right through with a hole rather larger than the intended drill spindle, which is not, however, to fit such hole, as it is supported in a pair of steel collars. The spindle should be at the least $\frac{1}{4}$ inch diameter, which will need a hole $\frac{9}{32}$ to $\frac{5}{16}$ inch. The best way is to bore with $\frac{1}{4}$ inch twist drill first of all, and then with the full-sized one. Work from both ends, reversing the bar several times until the cuts meet in the centre, which they will do with very tolerable accuracy if the work is not hurried, especially at that dangerous crisis when the holes are on the point of running into each other. After this hole is through, a larger drill must follow, and this should be sufficiently long to go right through at once. With regard to the method of drilling, a boring collar can be (preferably) used after the corners of the bar have been taken off as stated, and this is the usual way of working. But if no such apparatus is at hand, a drill must be held in a chuck, and the back centre used to advance the bar against it as the work proceeds. The bar may be held in the hand, and should be frequently removed to clear out chips, and as frequently reversed. If of steel, it will get perhaps

rather hot, and a leather glove may be needed to protect the hand. Plenty of oil, or soap and water with soda, should be used to lubricate the tool during the operation.

Supposing the work satisfactorily accomplished, the fitting of the collars may be proceeded with. These will be turned and bored out of the solid, and are to be fitted in recesses made to receive them at each end of the hole that has been drilled in the spindle. To make such recesses a boring collar will of course prove advantageous, but, failing this, the work should be recessed with a pin drill made on purpose, as it will secure its concentricity with the main hole. A pin drill is not, however, absolutely essential, as any drill may be used of a somewhat larger size than that which was taken to bore the bar; but as it is very easy at this point to spoil the job, and it is not so difficult to turn and file up a pin drill, it is a pity to run a risk of failure by not making and using one. Moreover, you can make it of the very slight taper required to make the collars fit tightly, which they must do; and they must be made to rest on a shoulder so that they cannot be drawn inwards. The drawings will render all this clear. To turn the steel collars is a job requiring neatness and care, but is not very difficult. They are coned—or rather one of them is so—both inside and out, and sometimes, but not always, both are alike in this respect; but the back collar, at the pulley end, is not unfrequently left parallel in the bore, to fit the spindle—slack occurring most frequently at the forward end where the chief strain takes place, and, consequently, the greater part of the wear.

Taking in hand, therefore, the front conical collar, first of all cut off a short bit of well-hammered bar. Let it be of square steel, and have it heated to dull red and hammered till it is round, which will also close the pores and render it solid. This is generally preferable to cutting a piece off the end of a round bar. Let it be $\frac{1}{2}$ an inch in length and commence by drilling it with $\frac{3}{16}$ inch hole. Then drive it in a steel spindle mounted to run truly between centres in the lathe, and turn the outside very slightly taper, leaving a shoulder at the largest end, or omitting this if it is to bed down upon the bottom of the recess drilled in the bar. Observe, you need not taper either collar or hole if you find it more difficult to do so, but a good fit must be made, and the bar heated tolerably hot when inserting the collar, which is thus shrunk in. By tolerably hot, I mean sufficiently so to expand it, not so heated as to soften the hard collar. Anyhow, turn the outside to a good fit and then drive it into a boxwood chuck, hollowed out to receive it, and turn the inside to about 60°, taper, or to 30°, with a second taper of 60°, like that of a lathe mandrel, the object being to prevent binding, and yet have a power of taking up slack when wear commences. This, however, is very slight when the spindle and collars are both hardened, and plenty of oil is used as a lubricant. Now take out the collar and drill an oil hole. The back collar is to be similarly turned and fitted, whether taper or otherwise. Before proceeding to harden the collars the spindle must be taken in hand. This, as stated, must not be less than $\frac{1}{4}$ inch diameter, exclusive of the single cone at the forward end. If a second is used, it will be a loose one. Taking a $\frac{9}{16}$ inch bar we may reckon the outside or largest part of the hole for the collar at $\frac{7}{16}$ inch, allowing $\frac{3}{32}$ inch to $\frac{1}{8}$ inch for the thickness of the collar at the large end. We leave about $\frac{5}{16}$ inch for the bore where the cone of the spindle rests, *i.e.*, for the size of the large end of the fixed cone. But this being at the point of contact, the cone itself standing out a little beyond it, the large end of it will be about $\frac{3}{8}$ inch or $\frac{1}{32}$ inch more before it is turned, and this part may be $\frac{1}{2}$ an inch long or $\frac{9}{16}$ inch in the rough. The shape of this will be like Fig. 1, which is a full size drawing, chiefly sectional, of the square bar, with its collars shown black and marked D, and the spindle B *in situ* with a cone C in front, and beyond it at A the receptacle for drills, the slot admitting a wrench to extract them without the chance of injury. At H is the spindle separate. The pulley E slips on at K, with a feather, and as it is pushed forward by the nut, the latter presses the face of the pulley (which is turned quite flat) against the end of the bar, and this draws back the front cone into its seat in the collar. I have had these drills also made with a cone attached like L. When a second conical collar is required, this cone and wheel also slide on a feather like the plain pulley. It is drawn as if for a much larger spindle, which is used when in addition to the ordinary fluting and ornamentation of surfaces the drill is also intended for heavier work and deeper cutting. For this, the end is often made with a screw for the attachment of the various cutters, small saws, and mills.

The eccentric cutting frame is a near ally of the above tool, and, indeed, it is not unusual to make one spindle answer for both, but combination tools are not generally satisfactory; and the amateur who has succeeded in making a drilling frame may very well try his hand on the eccentric cutter, which is certainly quite worth the trouble. The ornamental and other work, attainable by the use of this little apparatus is very extensive, and there is little real difficulty either in constructing or using it. At the same time, the amateur who is not a really fair workman, must not expect to make a cutter frame to rival one of

Holtzapffel's, and I only propose to help him in the construction of a fairly efficient tool, which will afford him amusement and enable him to do good average work.

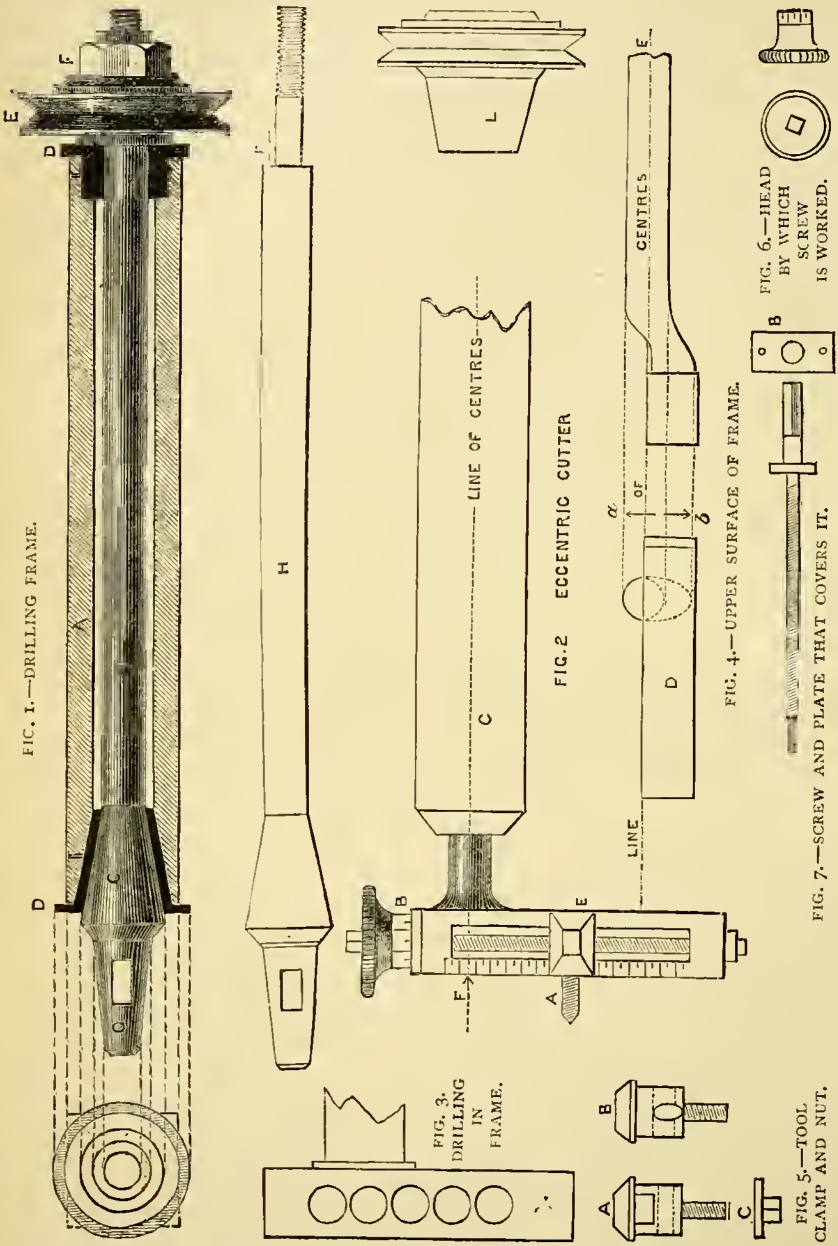


FIG. 1.—DRILLING FRAME.

FIG. 2 ECCENTRIC CUTTER

FIG. 3. DRILLING IN FRAME.

FIG. 4.—UPPER SURFACE OF FRAME.

FIG. 5.—TOOL CLAMP AND NUT.

FIG. 6.—HEAD BY WHICH SCREW IS WORKED.

FIG. 7.—SCREW AND PLATE THAT COVERS IT.

The main part of this cutter frame is identical with that of the drill, and a *cranked* drill is, in fact, an eccentric cutter; but it is incapable of alteration as regards length of radius, whereas, the eccentric cutter itself admits of very fine adjustment. Fig. 2 represents the actual cutter frame with part of the bar; it is merely a small rectangular frame of steel, 2 to 3 inches long, filed out of the solid.

This frame has to be accurately at right angles to the spindle to which it is attached, and which may be forged in one piece with it. The first operation will be to mount this spindle between centres, putting a carrier on the pulley end and bringing up the back centre to F. Then, with slow motion and very light cuts, face the side A of the small frame sufficiently to secure its position at right angles to the line of centres. You thus obtain a true face to work from and can file up the other, gauging it by this one. At the same time you will, of course, turn the spindle itself. When it is reversed the frame will act as a carrier. To get out the frame, drill it like Fig. 3, taking care to leave sufficient at each end and at the sides, and either with file or piercing saw, throw the holes into each other. In filing up the flats keep testing with a square from the face cut in the lathe, which has, of course, also to be finished by filing to take out the tool marks. We now have to consider one essential of this tool, which is that as shown at D, E, Fig. 4; the upper face of the frame must be exactly true to the centre line or axis of rotation. The frame is therefore, in one position, below the spindle, and not level with it. In the construction, therefore, it is evident that you must begin with metal from A to B, Fig. 4, and file away the superfluous part, or you will not be able to mount the whole between centres, which is necessary in order to get the rod with its cone true, and also (as described) the face of the small frame; but neither the filing nor turning can be called a heavy job. The frame should

be kept as light as is consistent with strength, as the vibration of an eccentric cutter is naturally great enough to be appreciable upon the pattern cut by its aid, unless care be taken to reduce it as much as possible. Still, much depends on the intended work, and a very small frame is not advantageous. The proportion of that in Fig. 2 will do very well. The head, B, by which the screw is worked of ten threads to the inch, is rather large, however; that in Fig. 6 being better. A and B, of Fig 5, are two views of the little tool clamp and nut. The hole in the latter, after it is tapped, is rendered oval by filing away the threads at top and bottom, so that when the little nut is screwed up, it may be capable of a slight traverse vertically, to allow the clamp to be drawn down upon the cutter. Fig. 7 is the screw, and B is the plate that covers it above its flange, this flange being let in flush with the end of the frame. Two small screws attach the plate which is seen at B, of Fig. 2, just below the milled head. This head is divided into ten, and these divisions are again divided. One division gives $\frac{1}{100}$, one half division $\frac{1}{1000}$, and one whole turn $\frac{1}{10}$ of an inch, as the traverse of the tool slide. The face of the frame is also similarly marked. It is as well to have the ordinary pulley about the size of that in Fig. 1 for quick speeds, and a second for slower speed and greater power. The face of the cutters lie flat on the frame, and these may, of course, be pointed, round, or variously shaped, according to the special work on hand. This tool, it may be stated, is not only for ornamenting on the flat with tracery, but for execution of deep cutting and carving.

PRACTICAL SCENE-PAINTING FOR AMATEURS.

By H. L. BENWELL.

(*For Illustrations of Built Proscenium and Necessary Framework, see Folding Sheet issued with this Part.*)

VII.—PROSCENIUMS.

ALTHOUGH prosceniums are possibly—next to act drops—the most difficult part of the scenic art for the amateur or novice to attempt, I have decided to place them first for description for various reasons, some of which I mention later on.

Long before the curtain rises on the play of the evening, the intelligent and artistic part of the audience whilst listening to the strains of the music proceeding from the orchestra, are, at the same time, scrutinizing and criticising the decorations and paintings of the proscenium and act drop. I need hardly, therefore, impress upon the novice that the painting of these require to be executed more carefully than ordinary "back cloths" and "flats," for during the short time the latter are exposed to view, the interest of the spectator is centered mainly in the acting and the plot of the play. But "between the acts," the case is different: the proscenium and act drop are then the principal attractions on which the eyes, after wandering carelessly round the auditorium, are finally brought to rest. For this reason, then, the proscenium should be as attractive as possible, but, at the same time, it should not be gaudy nor too bright. On the other hand, the act drop, being rolled up and out of sight during the progress of the play, may be painted with bright and effective colours, without fear of wearying the eye, or in any way detracting the beauty and brightness of the scenes upon the stage. In my opinion, and for this reason, prosceniums should, as far as possible, be painted in a quiet and subdued tone.

I treat on prosceniums first, because I wish to take each subject in hand as it stands in importance on the stage. But to the novice who has never, as yet, had any experience in distemper painting on canvas, my advice is, for him to try his hand on a pair of "flats" and some back cloths before attempting the proscenium and act drop. The painting of the latter are then more likely to prove successful, and be a credit to the painter.

As it is necessary to construct the wooden framework of a proscenium, and strain the canvas thereon, before the painting can commence, I will firstly draw attention to the drawings in the Folding Sheet, and describe the method of putting these frames together.

Making the Framework.—Having decided on the size the proscenium is to assume, proceed to calculate by measurement the quantity of wood required for the construction of the framework. Unless the painter be a good amateur or professional carpenter, however, this part of the work had better be given to one in the trade. If this advice is followed, the carpenter must be supplied with working drawings after the style of those given in the Folding Sheet; he should also have a rough sketch of the proscenium as it will appear when erected; in fact, a carpenter not used to the work is likely to make grave mistakes, and waste any amount of wood, unless great care is taken in giving him full instructions. I have often found this to be the case, and so I would advise that the carpenter be supplied not only with drawings of each separate frame *drawn to scale*, but also with a cardboard model of the proscenium, also made to scale. Should it be decided to make the framework, however, without professional assistance, the following few directions may possibly prove useful:—

When purchasing the wood, it should be left at the steam saw-mills with orders for its being cut up into

the proper dimensions ; I say this, because it will be found much cheaper to purchase one or two planks at a large merchant's than to procure the material ready prepared of a small master carpenter. For a moderate-sized proscenium, such as the one illustrated in the Folding Sheet (taking it for a drawing to scale as near as possible, of ½ inch to the foot), battens 2½ inches by a little over one inch in thickness, should be used in making the frames. Two cross-pieces will be found to give sufficient strength to the frames in this case, but for anything larger, another one should be added. The woodwork may be either mortised or halved together, the former being the best and strongest, although the most troublesome to the amateur mechanic. The built proscenium is constructed and fixed together in this way—A is what I term the *head-piece*, and is a three-cornered piece of framework ; the other frame, immediately beneath this, is the *top* of the proscenium opening ; these two frames are hinged together, A falling back on B for the time being ; C, C, and D, D, are the *sides* or *wings* of the proscenium, and are also hinged together. The hinges in each case are shown at I.

To make the proscenium complete for erecting, two pieces of board, H, H, ¾ inch in thickness are screwed on the back of B at each end, as shown. These boards should project beyond B a little over an inch (this being the thickness of the frames, C, C), a number of screw holes being made exactly in the centre. These boards may have, if preferred, some strips of wood nailed firmly to their edges at H, and thereby form grooves for the top of the frames, C, C, to rest in. If this last method be adopted, which is the stronger of the two, holes may be bored in each of these side strips, corresponding with holes in the top of the frames, C, C. Four small round-headed bolts are all that are then required to fix the top of the proscenium to the sides. Instead of using these pieces of board I generally make use of right-angled iron plates, one side having holes for screwing the plates to B, and the other side, two holes through which the bolts are inserted from the front of the proscenium.

Having made the frames, they should next be canvassed, and afterwards sized and primed, when they will be ready for the artist. Everything in the way of carpentry, however, should be done before the painting commences, as any alteration or tinkering after the work is completed will soon give it a shabby appearance.

It will be seen on reference to the drawings, that the proscenium, when made, is very easy to fix together. The wings, D, D, are firmly fixed at the back to the front uprights of the *stage* framework. This is generally done with iron angle-plates and bolts, but there are a great variety of ways by which this may be done. They are also steadied with iron or wooden stays and stage screws.* These wings, D, D, run parallel with the front of the platform or stage ; but the two narrow and inner wings, C, C, slope inwards, or in technical parlance, *up the stage.* These are also made to slope somewhat at the top, the exact angle being a matter of judgment. As these two sides not only incline up the stage, but also towards the centre, the top part, B, must be cut accordingly, in order to fit properly ; and to whatever angle this is made, such will be the angle the inner wings will be set at, when the proscenium comes to be fixed. All these measurements have to be decided on when the frames are being made, hence the necessity of a model.

Having made the side-wings secure, the top piece, B, may now be lifted into its place at O, and is either screwed or bolted up, as previously described. The head piece, A, is at present lying forward, or rather hanging down over the front, this is pulled into an upright position by means of a rope, running through a pulley fixed to one of the cross beams of the stage, behind the proscenium. An iron rod runs from this beam to the woodwork of the head-piece, which keeps it from falling either way. Any carpenter will know how to fix this part of the work.

The framework for flat prosceniums is made and fixed in a similar manner, but in this case, all parts are flat and run parallel with the front of the stage. The head-piece, E, is hinged to F, and when fixed up, is kept in its place by a batten or iron stay, as previously described for the built proscenium. To make the arched top, a broad 1 inch board is used, and sawn out as shown in the drawing. Two iron plates or pieces of board, H, H, are screwed on the back of the arched top at each end, and are provided with

* I am not at liberty just now to enter minutely into this subject, as it comes under the head of the stage-carpenter. This subject is not being treated on in the present series, as it is out of the artist's province, and I need hardly say, that in these chapters I require all the space at my disposal for the benefit of the latter person. The professional scene-painter, moreover, is not a carpenter : he merely gives an outline drawing of all work he requires done in this direction to the carpenter attached to the theatre, or some other workman. I will, therefore, presume, for the present, that the amateur either knows how to make all the requisite woodwork, or intends to follow the course of his professional brother, and that he is also more or less acquainted with stage-carpentry, and the details of a theatrical "fit-up." As regards stage-carpentry, stage-building, property-making, and other theatrical pursuits, I may possibly treat on these in a separate series of papers, but even should I do this, it would not be for some considerable time. I shall, however, be pleased to give information on any branch of theatrical work at any time, through the medium of "Amateurs in Council," so that my readers may not suffer any inconvenience through having to wait for want of technical knowledge on any subject.

screw holes, through which screws pass into the woodwork at the top inner side of the wings, G. To fix a proscenium of this sort, I lay it face downwards on the floor of the hall or room, and, when made secure, it is pulled into an upright position by ropes running through pulleys attached to the top of the uprights on the stage. It is then lifted by two persons from the floor of the room on to the raised stage, and secured to the uprights with angle-plates and bolts. While this is being done, another person must hold both the ropes that have pulled it up into position, or it would fall back. These ropes are afterwards hung behind the wings on a couple of nails or hooks, and are then in readiness for pulling down again after the performance. For a rather large proscenium of this kind, besides the two iron plates previously mentioned for fixing the top to the wings, I make use of two battens 3 inches wide and 1 inch in thickness. These I make to work on a pivot, fitted in the top part of the arched top (a screw will do very well for the pivot). These two battens run just along the top part of the frames which form the wings, and having some screw holes ready made, a few screws on either side will make the proscenium as firm as if it were all one piece. When the proscenium is taken down, these two short battens are turned over on the pivot, and are made to lay along the back of the arched top, and are kept there by a screw.

I think this short, but imperfect description of making the frames will enable anyone to overcome what at first sight might appear a very difficult part of our work.

The description I have given here, however, is only intended for occasional use, as the methods I have illustrated would be of no use in forming part of a travelling fit-up, which would, no doubt, very often be erected and taken down half a dozen times a week. Such is the case with some of Mr. D'Oyly Carte's Opera Companies, which are specially organized—as regards scenery—for visiting all towns without a regular theatre. It may seem hard work to visit six towns in one week, but such is often the case, and consequently the wear and tear of plant is enormous, so that the contrivances I have just described would soon be worn out and rendered useless. But for occasional use they will be found to work satisfactorily, and have one great point to recommend them, viz., simplicity in manufacture.

Painting Prosceniums.—Having strained the canvas on to the frames, and given it a good coating of size and priming, we are ready to start painting. I should mention here, however, that all canvas used for prosceniums should be primed on both sides, as by doing so, it gives it extra strength and durability. I will now offer a few suggestions as to the painting of the prosceniums from the designs which appear in this chapter, commencing with the built one given in the Folding Sheet. As soon as the priming is perfectly dry, proceed to measure out and draw in the design, making use of the straightedge for lining, and marking out the distances and spaces. When the drawing is completed, mix up a little burnt sienna with strong size, and with a small lining-fitch go over the whole of the drawing again, ruling all straight lines with the straightedge. If this drawing has been carefully and skilfully done, a bold outline of the subject should now be the result. The reason for going over the work with burnt sienna and strong size is to make an outline that will show faintly through each successive colour as it is put on, and so save the artist the trouble of frequently drawing in portions of the subject afresh. The triangle head-piece should now receive a background or a ground colour of very pale blue, for which use flake white, with just a dash of Prussian blue mixed in. The ground colour for the sloping top and the inside wings should be a buff tint, made with whiting, yellow ochre, and Venetian red. The ground for the two outer wings may be left in the white, or coloured with some delicate tint according to fancy.

Having laid in our ground colours, proceed to paint the royal arms on the head-piece. As anyone can get a coloured sketch of this part of the design, I shall not waste space with describing its painting, suffice it to say, that it should be made to stand out well, and look the most effective part of the work. The scrolls on either side of the arms are painted with yellow and orange chrome, and shaded with burnt sienna; flake white, mixed with a little yellow, being used for the high lights. The plain mouldings should be painted a grey tint, whilst the fancy mouldings are painted with a ground colour of yellow or orange chrome, and the ornaments or fancy design put in with burnt sienna or Venetian red. Damp lake may also be used in some cases. As several mouldings and scrolls appear in each of the three designs, I had better say, in order to save space, that unless directions are given to the contrary, all mouldings, etc., are painted as just described. The shadows that fall from the mouldings, scrolls, etc., on to the blue ground, should be painted with a darker shade of the blue tint. The panels and Shakespeare medallion on the proscenium top may have a ground colour of blue or pink, the ornaments and mouldings being treated as before. The wide moulding over the panels and medallion must next receive a coat of pearl grey, and the stencilled design painted in with damp lake. The pedestal, brackets, and heads on the side wings are painted to imitate verde antique marble. This is a special process, and is done by myself as follows, although every scene-painter would, no

doubt, say I was wrong, for each one has a method of marbling peculiarly his own, and, of course, the process is somewhat different to marbling in oil colours.

The ground in verde antique marble is a dark green. Have this colour mixed up in a pot to the consistency of thick cream, and commence to lay in the whole with a large tool. The marbling colours are dark brown and green. These are mixed up very thick in separate pots, and the work scumbled over with them, whilst the ground colour is still wet. Next mix together some flake white and Brunswick green, scumble over again and soften off. Now take a fitch and paint in masses of black in irregular shapes, wash the brush, and put in similar masses of white, and soften the whole off whilst still wet. The shaded parts are worked in somewhat darker, whilst more white is used for the lights. The panels and figure at the top are painted a self colour of a light green, and outlines put in with yellow chrome, flake white and Venetian red respectively. This part of our work must not look too stiff, and must be done in a free and easy manner.

The piece of scalloped drapery at the top is not a part of the proscenium, but is a separate piece of canvas painted separately, and afterwards cut out according to the outline. It is tacked on to the proscenium after it is erected, and previous to the act drop being hung. The only colours required to paint this are crimson lake, blue, and chrome. The outer wings come next, and with these the painter will have but little trouble. We will suppose the canvas has been left in the white and the design drawn in on this ground. It will be seen there are five distinct mould-

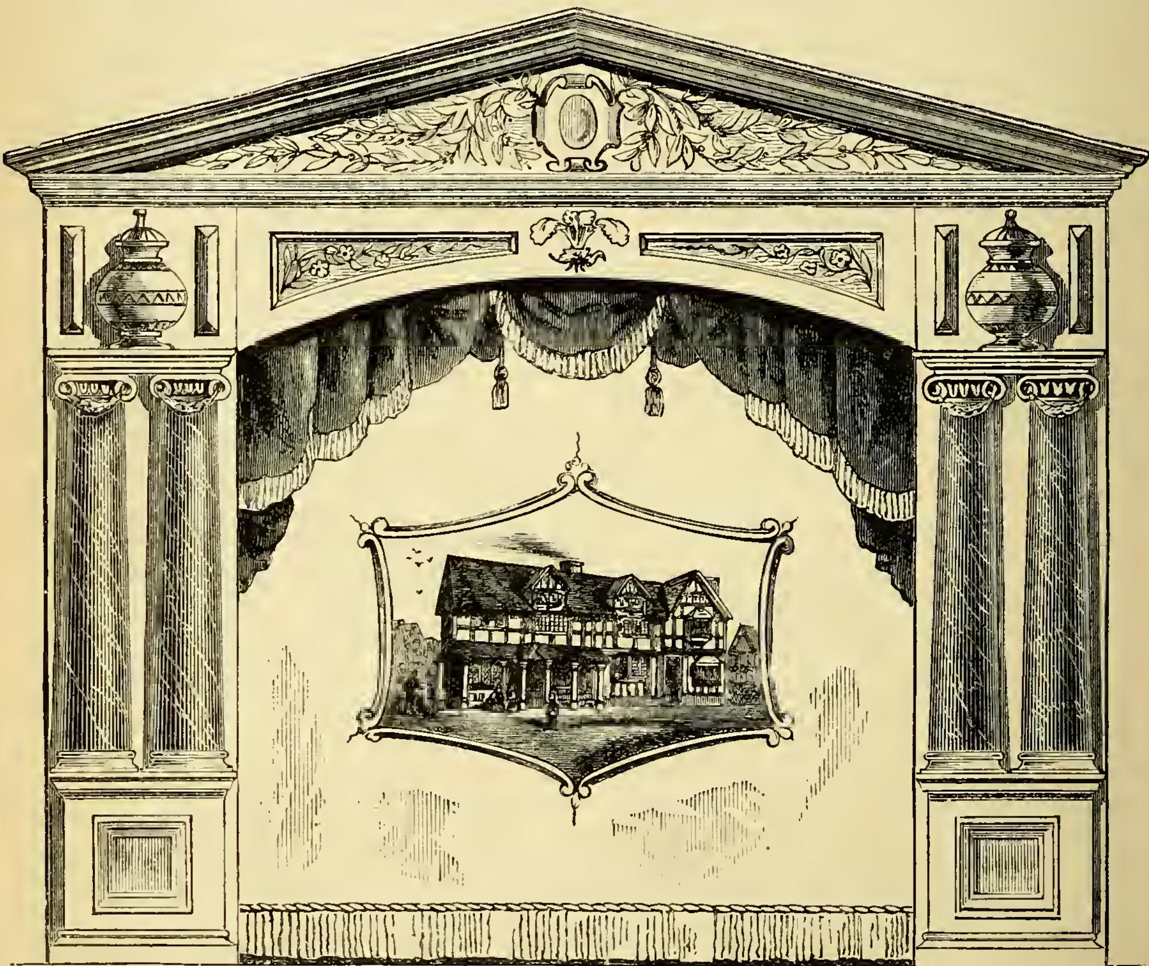


FIG. 42.—DESIGN FOR FLAT PROSCENIUM.—ACT DROP, SHAKESPEARE'S HOUSE.

ings to colour, and between these two plain spaces. The centre spiral moulding may be painted with lake and marked up with yellow chrome. The other two mouldings in the centre are yellow marked in with Venetian red. A good broad band of pearl grey divides these three mouldings, all the lines on same being put in with Venetian red or lake. The other two (outside) mouldings paint as before described· The two spaces which appear white in the design will look very well if left so, on the canvas, but they can, of course, be painted if desired, any suitable tint. The ornament on the outer side white space in each wing is painted with delicate tints of pale pink, yellow and blue.

This concludes the colouring of this—the built proscenium—and space will only permit to touch lightly on the other two designs.

The flat proscenium, Fig. 42, should receive throughout a good grounding of an electric blue tint, which if rightly mixed should come out well when dry. The pediment and cornice moulding of the head-piece is painted a fawn or pale yellow tint. The shield in the centre is a rich gold and shaded. The floral decorations on each side are painted as follows: For the stems use burnt sienna, and for the leaves use alternately pale pink and yellow tints. The "Feathers" on the arched top are white shaded with blue, the gold band being chrome yellow shaded with burnt sienna. The floral decoration is a pale yellow and pale green. The goblets on the side wings, I once put in with

FIG. 43.—DESIGN FOR FLAT PROSCENIUM.—ACT DROP, LANDSCAPE AND FIGURES.

gold bronze, shading with copper bronze. In this case they looked very well, and kept very good colour. The sinkings on each side of the goblets are yellow, shaded with Venetian red. The pillars, etc., are made to represent Italian marble, one of the finest we have, and which will stand well out against the blue background. Proceed as follows in the painting: Give the pillars a ground of white (whiting will do), compound tints of ultramarine, and flake white, and red lead and flake white. Whilst the ground colour is still damp, but not too wet, put in broad masses of these tints throughout and soften off. Next with some feathers or a lining fitch put in some irregular and broken veins, first with flake white, and afterwards with a little blue black used very thin. Soften off the whole, and allow to dry. Afterwards slightly shade the pillars with brown lake to give them the appearance of being round. The rest of the work in this design is very simple, and may safely be left to the painter's judgment, however inexperienced he may be in the art of colouring or decoration.

Possibly the next design, Fig. 43, will be the most generally liked of the two flat prosceniums, it is, however, harder to make and paint. I would suggest that it be painted somewhat as follows, although these directions can be vastly improved upon, my intention being to make the colouring as simple and easy as possible, so as to be of use to the unskilled painter.

On referring to the design, it will be seen that the head-piece in this case runs right over the sides or wings of the proscenium. The framework is also made in the same shape for the head-piece as it appears in the drawing, and the whole of the proscenium is fitted together exactly the same as that I have just described. First, give the head-piece a ground colour of French grey, the background for the proscenium top and side-wings being a salmon tint, which should not be of too dark a shade. It will be seen that a plain border runs along the top of the head-piece, this colour a light blue; immediately beneath is a fancy moulding, this put in as described previously with chrome and Venetian red. For high lights in all gold mouldings use flake white and yellow chrome. Several of the mouldings in these designs should have a straight line running through them, the tint for which is a mixture of white and yellow. This gives them a very real appearance if done properly. The shell work comes next, and this paint with white tinted with a little blue; shade with a light blue, and mark in the outline with a darker blue. The circular moulding and scroll work treat as before described.

The panels on the top of the proscenium and on the top of the side-wings are laid in with a buff tint; the ground colour for the vignettes being a pale blue. The borders running round these colour with orange chrome, orange red, and sienna. The portraits on each side should be painted to signify deep tragedy and broad comedy. Those of my readers who are not portrait-painters have no cause to be discouraged, for instead of painting in portraits here, some oleographs may be cut to the right shape and pasted on. Of course, a suitable subject should be selected for this purpose. The harp in the centre put in with damp lake and orange chrome. The spiral columns on the side-wings painted with three distinct shades of, say a lavender colour, which, I think, will look well. Use flake white sparingly for the high light. The capitals are yellow shaded with burnt sienna. Lay in the panels with a bluish white. The scrolls are painted with damp lake and a purple tint, using here and there a little flake white and chrome to heighten the effect of the work. A broad line is shown running round the edge of the proscenium opening; this is a border of gold foil, which is stuck on with glue and flour paste mixed in equal quantities. The lining on the foil is done with burnt sienna ground in oil, and bought *mixed ready for use.*

Scene-painters paint prosceniums in a style quite their own. I can hardly describe it, so I advise a visit to some professional hand. This can easily be managed in almost any moderate sized town by making oneself known at the local theatre. By this visit if the student will only watch the practised hand for half-an-hour, more will be learnt as to the *modus operandi* of scene-painting than I could hope of describing in a lifetime. Many wrinkles can also be picked up, and that knack of handling the brush which it is next to impossible to describe in a book, at least as far as the writer is concerned he frankly owns his descriptive powers—at the best very moderate—here completely give way. The alternative then is to pay a friendly visit to a professional painting room, and while there make the best use of your time.

My directions as to the painting of the proscenium from the designs given with this chapter, have necessarily been somewhat meagre, but I trust that the instructions that have been given will prove sufficient for all practical purposes, as the colours that must, or ought to be, used, have been mentioned for every part, and the course to be adopted in applying them has been carefully pointed out.

The act drops will be discussed in a future chapter, in which detailed instructions will be given for painting them. It is enough at present to say that they will be found very effective, and as three are given in the Folding Sheet and Figs. 42 and 43, there is as much scope given for choice as is possible to afford in the space at command. Other and various designs however, will doubtless suggest themselves.

(*To be continued.*)

HANDY WORK IN FARM AND GARDEN.

By GEORGE EDWINSON.

VI.—STILES, WICKETS, GARDEN-GATES, ETC.

THERE are other forms of stiles besides that mentioned and illustrated in my last article. All stiles constructed alongside field-gates and in the track of pathways, are not always shaped as shown at Fig. 66, nor are they always so firmly made with mortise and tenon joints. Three or four stout rails let into two upright posts placed at a distance of 4 or 5 feet apart, and secured thereto by stout spikes, frequently represents a country stile, but this is not to be recommended. Where long slabs of stone are obtainable, stone stiles may be constructed, such as are sometimes met with in the walls of country churchyards. These stiles are formed by building into the bottom of a gap left in the wall three slabs of stone, each of the following dimensions, or nearly so—5 feet in length, 1 foot in breadth, and 6 inches in thickness. Each slab is fixed on its edge and the slabs are placed 6 inches apart. Above these are fixed two more slabs of similar dimensions, each overhanging the spaces left between the lower layer of slabs. Over the space left between these two is fixed another slab in a similar manner, the five outside slabs are thus made to represent three steps, as shown at Fig. 68. Sometimes the number of steps are increased, and such "high and awkward stiles" are by no means pleasant to cross in frosty weather when the stones are slippery. Another form of stone stile is shown by Fig. 69, which represents long slabs of stone built into a stone wall in such a manner as to leave the ends protruding some 8 or 10 inches, and thus form a series of steps up one face of the wall to the top, and then down the other side. This form is admissible when supplemented by a wooden handrail, but is otherwise unsafe for females, children and old men, especially so in wet and windy weather. An excellent and ornamental form of rustic stepstile suitable to such situations is described and illustrated in pages 463, 464, 465, Vol. I., by Mr. Arthur Yorke, whose articles on "Rustic Carpentry" should be read by all interested in the subject.

Stepstiles of all kinds (except the last mentioned) are, however, but rude relics of those barbarous times when pious men deemed penances meritorious, and an indulgence in the luxuries of comfortable church pews a sin. A higher and more reasonable civilization demands an easier and less cumbrous means of passing fences intersecting a public pathway, and wickets of many kinds have been invented to supply the demand. Perhaps the first departure from the old track of stiles was the zig-zag line of posts, or the double line of the same sometimes met with at the entrance to pathways. The next departure would be the common turnstile with a revolving cross on the top of each post. It is possible for a female to decently pass through those narrow ways, since crinolines have gone out of fashion, but it is not possible to do so with the old forms of stepstiles. But zig-zag posts and common turnstiles are rude contrivances when compared with the neat and commodious wicket shown at Fig. 70. This can be easily made by the amateur carpenter or handy man on a farm, and is sometimes named a V wicket. The materials for this are the same as for field-gates, viz., sawn oak or larch, the former preferred. How much wood shall we require for this job, and of what dimensions? The rails and stays should be of 2 inches by $2\frac{1}{2}$ inch stuff, and of this we shall require 21 feet. The posts of the V guard, and the stiles of the wicket, should be of 3 inch by $2\frac{1}{2}$ inch stuff, and of this we shall want 22 feet. The palings will be cut from stuff $2\frac{1}{2}$ inches by $\frac{1}{2}$ inch, and of this it will be well to provide 52 feet. In addition to these we shall want a stout post some 6 inches square above ground, and at least 5 feet in length, to serve as a wicket post. The dimensions of the wicket are as follows: Front and back stiles, 3 feet; top and bottom rails, 3 feet; diagonal stay, 4 feet 4 inches; palings, 3 feet; cut socket mortises, 1 inch by $2\frac{1}{2}$ inches by 2 inches deep in the stiles for the rails, and cut tenons on the ends of the rails to fit the mortises. The top mortise in the front stile and the bottom mortise in the back stile must be sloped at one end of each to admit a taper tenon $1\frac{1}{2}$ inches long cut on each end of the diagonal stay. The position and form of this mortise is shown at Fig. 71. The advantage obtained by having the stay thus tenoned will be easily seen, for it will then support both rails and stiles, and bind them all together. Cut the mortises true and the tenons a close fit, and be sure to have the shoulders of the tenons equal in thickness on both sides, and their edges true with the stiles, for the strength of the wicket will largely depend upon good fitting in those parts, whilst a gaping joint will also disgrace the workman. Use a tenon saw to cut the tenons, and try the joints with square, gauge, and rule before pinning the parts in their places. When every joint has been proved to fit, put the parts together and bore holes with a $\frac{1}{4}$ inch centre-bit to receive the pins. Bore the holes half way from one side into each tenon, then turn the work over and bore through to meet the first hole. Let the pins be of oak cut taper and true to a size slightly larger than the holes in the stiles, drive the pins home tight with a mallet, and thus brace every part of the wicket together. This done,

space out the distance between the stiles, and mark the position of the palings. Allow about $1\frac{1}{2}$ inch space between each paling. Cut these out to the form shown in the figure, and secure each in its place with two nails driven into each rail. The pointed tops will prevent boys from riding on the wicket, and, if we use quartering sawn across the diamond for rails and stays, all temptation to ride the wicket will be put away. The same remark applies to the rails of the V guard, and may be extended to the posts of the guard. The sectional sketch of the posts in the plan of a wicket shown at Fig. 72 will more clearly explain my ideas on this subject.

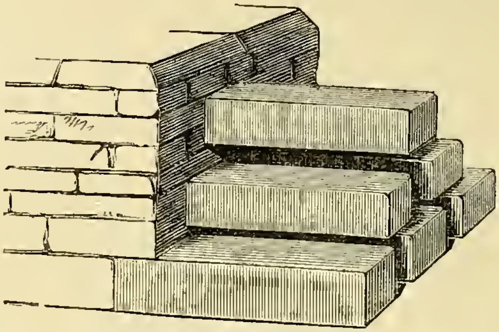


FIG. 68.—EXAMPLE OF STONE STILE.

It will be seen on referring to Fig. 70 that the rails of the V guard are not fastened to the posts by tenon and mortise, but that the ends of the rails are partly let into the posts by notching the latter for this purpose; the rail is, however, also cut as shown in Fig. 73, and this is fitted securely into the notch, then fastened there by two or three nails. Fig. 72 will show that the wicket is hung to a stout post placed in a line midway between the two posts of the guard, in such a manner as to allow it free motion between the posts, but it is prevented by the two posts of the guard from being swung wide open. Passengers push the wicket from them to one of the posts, then step back into the guard and pull the wicket over to the other posts, thus opening a passage out. To prevent mischievous persons from lifting the wicket off its hangings, it should be furnished with one of the special attachments shown in my last article, applicable to field-gates as a preventive against gates being unhung by pigs. It is scarcely desirable to tar a wicket, but, if made of oak it might receive two or three coats of oak varnish, or it may be painted, and, if made of fir wood it should be certainly painted. A portable means of passing through a hurdle fence may be easily contrived on the principles of this V wicket. Two hurdles can be easily fixed to form the guard, and a broken hurdle be made to do duty as a wicket, by hanging it to a stout stake with hoop iron, fence wire, or even stout twisted bands.

Most makers of iron fences also make and provide wickets of this description to be used in their fences. The guard is made to take a U form, and is named a bow-wicket. The wicket is hung to a stout iron post fixed firmly into the ground. These wickets are very desirable at intervals along a long line of fencing and in the track of pathways. Iron stepstiles are sometimes provided, but wickets are always preferable to stepstiles. Men and boys will frequently prefer forcing themselves between the wires of fences rather than climb a stepstile, with a result most damaging to the fences.

Where a right of way exists across a farm by bridle path, we must provide something between a wicket and a farm-gate, namely, a small gate wide enough to admit a horse, but not wide enough to admit an ordinary vehicle. Wickets of this kind are also useful in field fences of all kinds in country likely to be frequently traversed by hunting parties. The wickets should be always kept well painted in a conspicuous colour, and, if properly placed, will frequently prevent broken fences. Such wickets or bridle gates should be made strong enough to resist a thrust from the breast of a horse, and should be always provided with a self-fastening latch easily opened with the handle of a whip. It is advisable, therefore, to furnish wooden latches with an iron loop to each latch, and to use iron latches with looped handles wherever practicable.

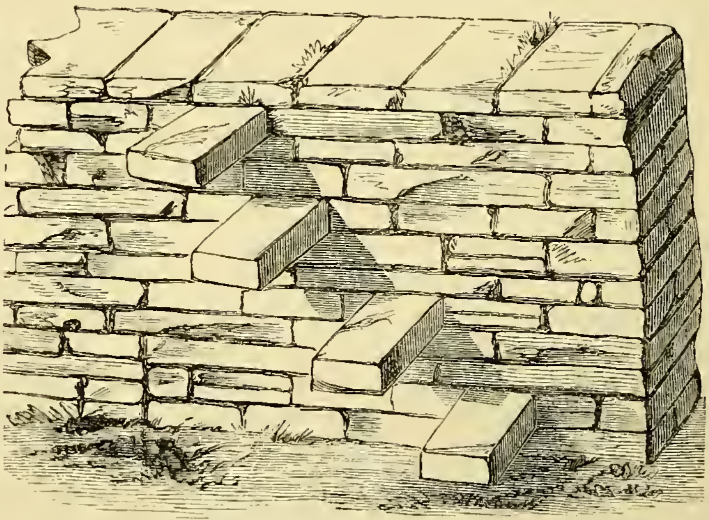


FIG. 69.—STONE STEPS PROTRUDING FROM STONE HEDGE OR WALL.

It is also advisable to hang the gate with a good fall to the front post, so that the gate may close of itself behind the horseman. No special instructions are needed for the construction of those gates, since they need only be small field-gates. A special and novel form is, however, shown at Fig. 74, which illustrates an American hand - gate made entire-

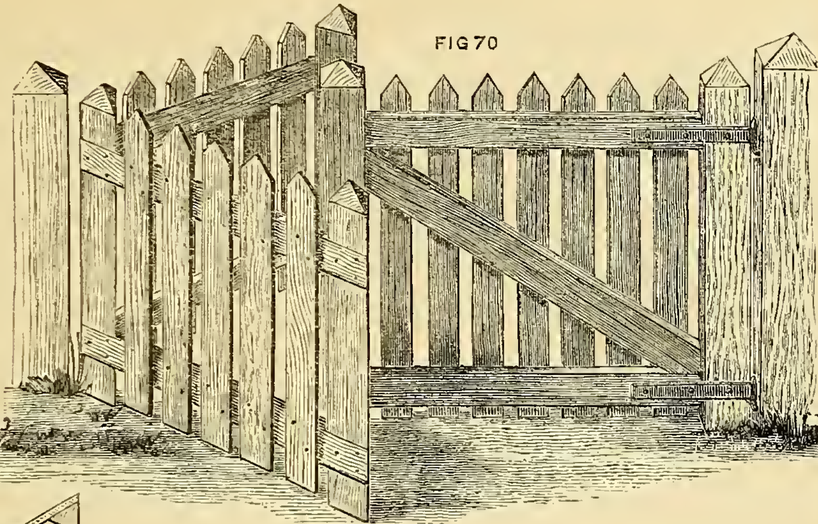


FIG 70

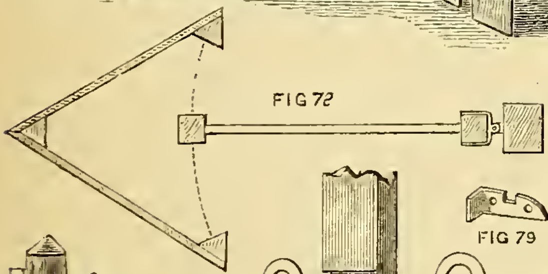


FIG 72

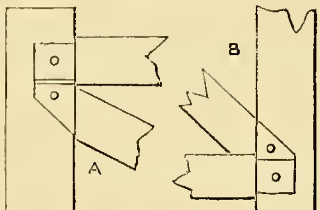


FIG 71

FIG 73

FIG 77

FIG 79

FIG 78

FIG 80

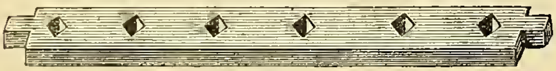


FIG 76

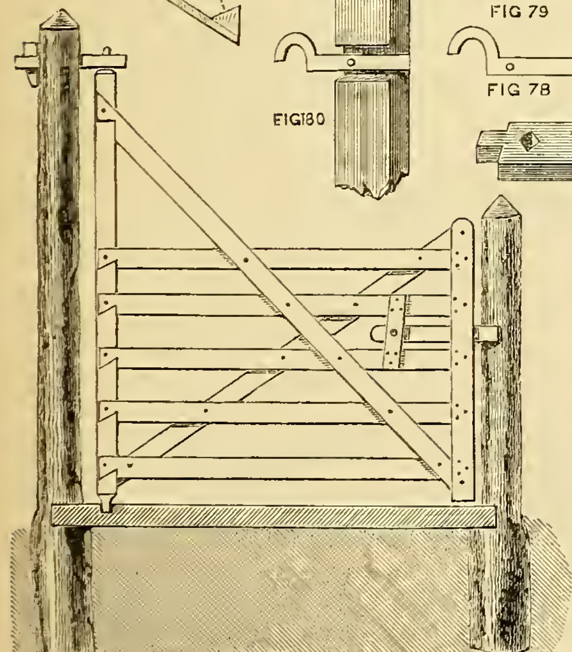


FIG 74

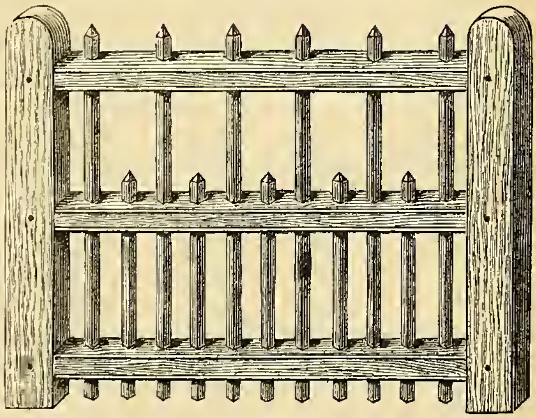


FIG 75

FIG. 70.—V WICKET. FIG. 71.—MORTISES FOR STAYS OF WICKET. FIG. 72.—PLAN OF V WICKET. FIG. 73.—END OF FENCE RAIL. FIG. 74.—AMERICAN WICKET. FIG. 75.—GARDEN GATE OR WICKET. FIG. 76.—RAIL OF WICKET PIERCED WITH HOLES FOR RAILS. FIG. 77.—SUGGESTIONS FOR ORNAMENTATION OF STILES OF WICKET. FIG. 78.—LATCH. FIG. 79.—CATCH FOR LATCH. FIG. 80.—PORTION OF FRONT OF FALLING STILE OF WICKET SHOWING HOW TO FIX LATCH.

ly of wood, no blacksmith work being necessary. The sketch plainly shows method of construction.

Garden-Gates and Wickets.—The frames for garden-gates are constructed similar to those shown at Figs. 70 and 75, and the gates are finished in a style in harmony with the fence of the garden. A fence formed of open upright palings might be furnished with wickets of either style. A fence with close palings should be furnished with wicket, Fig. 70, fitted with close palings. Bar or rail fences should have wickets, Fig. 75, while rustic fences look well when supplied with a wicket with a similar frame filled in with oak or fir wood designed to match the fence. A strong useful and ornamental garden-gate for all open fences, may be constructed by filling up the spaces between the rails with small diagonal stays, instead of upright bars. These may be arranged to form a diamond in the centre of the wicket, and present the appearance of two crosses (X). As the stays will not weaken the rails, these and the whole frame may be made lighter than when constructed for bars. A still further move towards an ornamental gate may be made by our handy man if he has tools and the necessary skill to use them in working bent wood, by having the stays curved. He may also further improve the appearance of the stiles by trimming off their corners, and ornamenting the tops with a few sockets bored with a half-inch centre bit, and cut out with a half-inch chisel as shown, Fig. 77. The additional labour incurred in making such touches as these will be very small, and will be repaid by an enhanced appearance of the wicket. In the sketch, Fig. 75, the wicket is shown with upright round bars fitted tightly into holes bored in the rails; at Fig. 76 is shown a rail perforated with diamond-shaped holes, and this form is sometimes preferred because it is easier to plane up bars having a square section, and fit them in such holes, than to make perfectly round and smooth bars, and fit them in round holes.

The commonest form of fastening for all wickets, including garden wickets, is the latch shown at Fig. 78. This is inserted into the front stile of the wicket through an oblong hole cut for the purpose, as shown, Fig. 80, and is pivoted on an iron pin driven transversely through stile and latch. When the gate is closed, this latch engages with the catch shown at Fig. 79, which is fixed by screws to the inside of the front gate post. This catch is furnished with a projecting piece to act as a stop to the gate, and the gate is hung to such a nicety as to latch itself when allowed to fall against this stop. If no stop has been provided, it will be necessary to nail a strip of wood to the post to form a stop. For other forms of latches and fastenings I beg to refer my readers to the previous article on "Field Gates."

Repair of Gates.—Occupiers of farms and gardens should always see to it that all fences and gates are kept in thorough repair. More time is lost on a badly managed estate in opening and closing badly hung gates, than would suffice to put them all in good repair. If a gate is sprung and drags heavily on the ground, get it seen to at once. If the top crook is drawn, unhang the gate, fill the hole with long oak chips, and drive the crook in firm again, then re-hang the gate. If the post has been loosened, unhang the gate, and tightly ram a quantity of rubble down by the foot of the post, and thus force it back into its original position. If the frame has been sprung by children riding on the gate, remove the stays, then square the frame, replace the stays, and put in a few stout screws to brace the whole gate well together. If a bar or rail is broken, do not patch it with pieces of wood nailed on each side, but take it out and replace it with a new rail, the time spent, and the cost will be the same in both cases, whilst the result of a new rail will be superior to that of a patch. If the front post has been struck with the wheel of a vehicle and pulled away, the gate will not latch, and the post must then be firmly fixed in its place again by ramming some rubble around its foot. Do not leave the gate until it will properly latch itself when swung to the post, and do not be content if it will latch when lifted a little. Shifting the latch guard to throw the latch a little higher will sometimes suffice when the gate or post is not badly strained.

Always carry a few nails, and a hammer with a short handle in your coat pocket when moving about the farm, and put in a nail where it is required. A little grease on crooks and hangers occasionally will also lessen wear and tear of iron. If gates are tarred or painted, renew the coat when it shows the wood, and do not allow them to rot for the sake of the proverbial "ha'porth of tar," for the want of which, in one form or another, a good many things besides ships and field gates and fences are allowed, if not absolutely to "go to the bad," as the saying runs, at least to suffer deterioration to an extent that is absolutely painful to those who are not, and can never be, satisfied with work of any kind unless it be done in the best possible manner. "Whatsoever thy hand findeth to do, do it with thy might," holds good for work of every kind, be it what it may, but it is a piece of wholesome advice that is sadly neglected in these days, when men seem to strive to see how quickly they may get through their work, rather than how well and how thoroughly they may do it. In farm work a handy man who looks well after the state of gates and fences on an estate, will put money enough in his employer's pocket to more than pay his wages.

(*To be continued.*)

FISHING TACKLE:

ITS MATERIALS AND MANUFACTURE.

By J. HARRINGTON KEENE.

VII.—THE ROD AND ITS VARIOUS PARTS AND FITTINGS.

BEFORE the amateur can make his rod, it is self-evident that he must have the necessary materials and tools. A few remarks on these heads must therefore preface the description in detail of the actual operation of manufacture.

Materials.—I have already expressed my predilection for greenheart, and will assume that the beginner is anxious to make such a rod as that shown in Fig. 75, and to construct it entirely of this wood. Let him, therefore, write to Mr. G. Currell, of 6, *Jewry Street, Winchester*, stating that he requires greenheart for a rod of that description, sending him at the same time the number of AMATEUR WORK containing the article and illustrations. The reply he will receive will be a guide for future transactions, and I am sure that Mr. Currell will give him no cause for complaint. He will receive the necessary wood, roughly cut in lengths for the joints, which lengths may be of the following measurements, to be long enough for a 12 foot rod: Butt, or thickest joint, 3 feet 4 inches; second joint, 3 feet 4 inches; third joint, 3 feet 3 inches; top, 3 feet 1 inch; and the wood must be thick enough to work out to the gauge of the rod, whose ferrules, counters, butt, and top, are given in Fig. 80.

So much for the wood. We now come to consider the fittings. The ferrules are the first requirements in this connection, and it is not probable that the tyro will be able to make them himself, for the reason that they must be exceedingly true, and nothing but the machinery specially invented for the purpose could turn them out satisfactorily. There are two kinds of ferrules—one kind is sawn off ordinary brass tubing, and the other is made separately from sheet brass turned into a tube, and the joint brazed; this latter is far and away the best, so when you are sending to Mr. Currell be careful to ask for the brazed ferrules and their counters. "Counters" is the term used to designate the brass work, shown at A, B, Fig. 80, and which fits into the ferrule, as shown by the dotted lines. Besides ferrules, as shown in Fig. 80, as necessary to the build of a rod, there are some persons who dispense with the smaller ferrule indicated at B, and use only the larger, as shown at Fig. 81, C fitting tightly into D. If these ferrules are good and true, this joint answers capitally, and obviates the difficult process of boring for the small counter, a process of great delicacy, as will be seen when I proceed to advert to it. If rod keepers are whipped on, as indicated at E, Fig. 81, this plain ferrule is every whit as serviceable as the other. The keepers are tied together with strong thread, so that the joint cannot slip. I have already, in page 138 and following pages of this Volume, given details of improved winch fittings; of course, they are as I indicated, extremely serviceable, but when cost is an object, the old-fashioned fitting is preferable. Fig. 82 shows it. The whole is of brass; A is a brass tube with rectangular piece cut out at B; C is a ferrule, which is stationary; and D is a moveable, which is pushed up whilst the plate of the winch is passed under C in the rectangular open space at B, and is brought down to confine the upper end of the plate. This winch fitting has a decidedly handsome appearance, being all of brass, and polished when in its place on the rod. For commoner rods, three ferrules like those shown at Fig. 83 are substituted. A is the upper one, and is fixed, B slides, and C is fixed, a rectangular space about three inches long by $\frac{3}{4}$ inch wide, and $\frac{1}{8}$ inch deep, is cut in the butt of the rod, extending some distance under C, into this the winch plate is passed, and the ferrule B is pushed over the upper end. These ferrules can be got with the others, of Mr. Currell, if desired.

Having noticed the ferrules, we pass on to the line rings. Of these, there are several sorts, and some of them can be made by the amateur. I will refer to those first that can be readily manufactured at home. They are indicated by Figs. 84, 85, 86, and 87. Fig. 85 is, as can be readily seen, simply a wire, German silver or brass, twisted into the shape shown, and the extremities flattened. As the rings up the rod must not be all of one size, pieces of steel wire of different gauges may be employed as moulds round which to twist the ring wire. This done, a tap or two with the hammer and a touch of the file, completes the ring. Fig. 84 simply consists of two pieces of hardened brass wire placed in juxtaposition. At their point of juncture they can be touched with a little solder, but if they are whipped on truly, after having their meeting edges flattened with the file, they will be secure enough. This form of ring is, without exception, the best in practice that I know of, the line cannot get round it or entangle. Fig. 86 is also easily made The dotted lines indicate the mould round which the brass wire is twisted, and the rest of the illustration speaks for itself. Fig. 87 shows the top rod rings of various sizes, all easily made as before, and they are, though not the most fashionable, certainly one of the most serviceable and easy to fix, and when this is the case, I really do not see why more expensive appliances should be sought after. However, sought after they are, if only to increase the cost of a rod. Figs. 88 and 89 are two forms of solid rings, both to be recommended, if only on the score of their un-

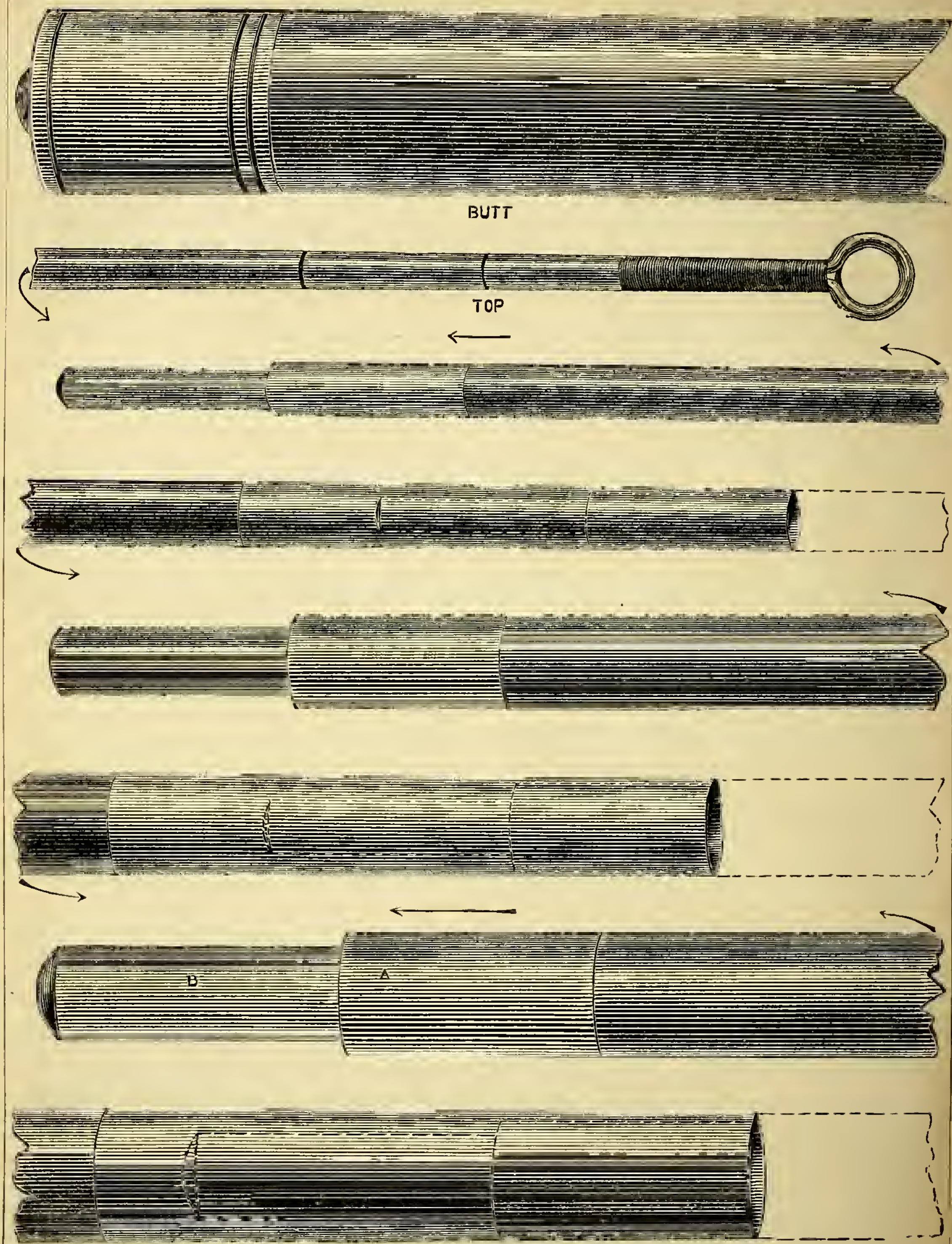


FIG. 80.—BUTT, TOP, FERRULES AND COUNTERS OF TWELVE FEET PIKE ROD.—FULL SIZE.

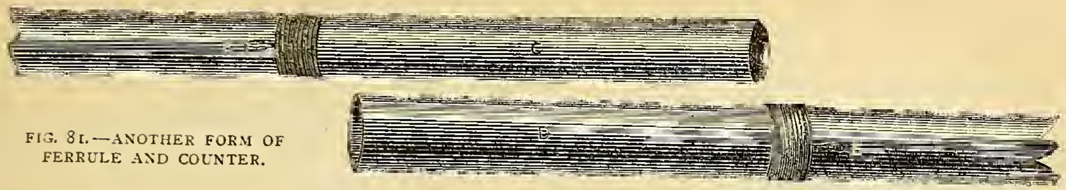


FIG. 81.—ANOTHER FORM OF FERRULE AND COUNTER.

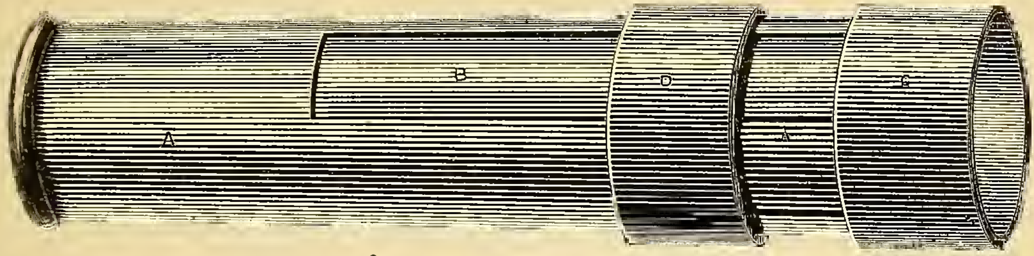


FIG. 82.—IMPROVED BRASS WINCH FITTING.

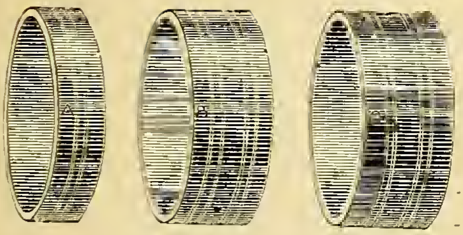


FIG. 83.—ORDINARY WINCH FITTINGS.

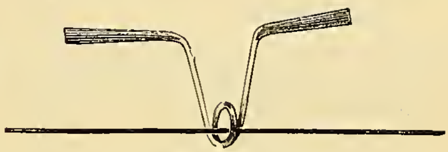


FIG. 85.—ROD RING.

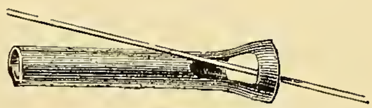


FIG. 89.—SOLID TOP RING.

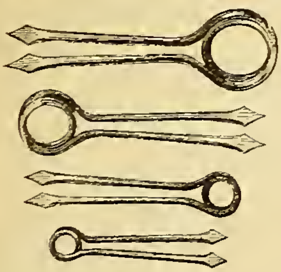


FIG. 87.—TOP RINGS.

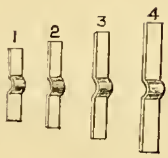


FIG. 91.—RING KEEPERS.

FIG. 92.—ROD RING.

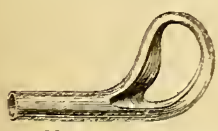


FIG. 83.—SOLID TOP RING.

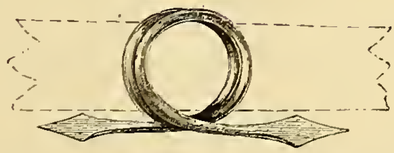


FIG. 86.—ROD RING.

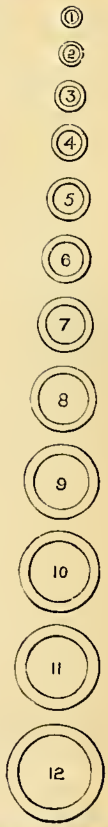


FIG. 90. BRASS ROD RINGS. NOS. 1—12.

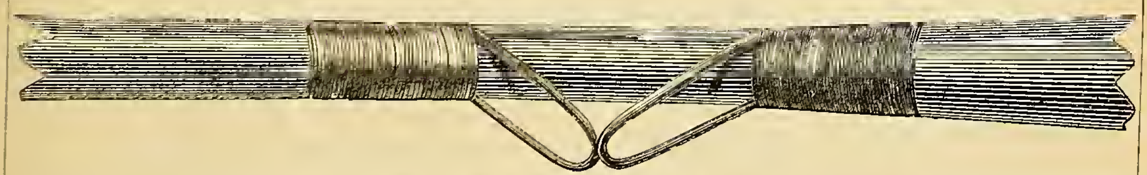


FIG. 84.—SIMPLE BUT EXTREMELY EFFICIENT ROD RING.

breakableness, and the fact that the line cannot entangle round them.

Of those rings which are not rigidly fixed, and are generally used for the fly rod, Fig. 90 gives a representation, and the numbers by which they are known to the tackle-maker. I need scarcely say that the largest is used for the butt of the rod, and they follow on to the point in decreasing gradation of size. They are fixed by ring-keepers, as shown at Fig. 91, the size numbers of which are also given. In attaching them, the keeper is slipped through the ring, until the latter lies in the indentation prepared for it, and the keeper is then whipped to the rod. Fig. 92 is another very satisfactory line ring, invented by Mr. J. P. Wheeldon, I think, and generally attached to the more superior Nottingham rods. The diagram, I venture to say, needs no explanation.

(*To be continued.*)

HINTS ON THE UTILISATION OF WASTE MATERIALS.

By R. LEWIS.

II.—CAT TEASERS—PIPE RACK—BRUSHES FOR GUMMING, ETC.—PEN RACK—PICTURE FRAMES—WATCH STAND.

CAT TEASERS (Fig. 16).—A plate of metal with two cuts meeting at an angle, and made at given intervals, the points thus made being turned up. These plates can be fixed on walls or upon boards, so that they may be placed in window ledges, or where the cats undesirably frequent.

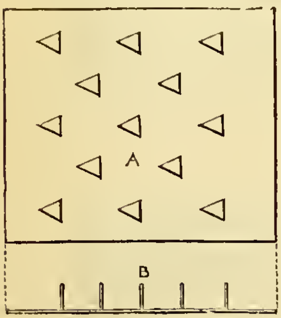


FIG. 16.—CAT TEASERS.
A, Plan of Plate; B, Elevation.

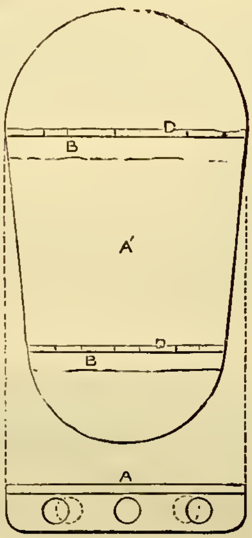


FIG. 17.—PIPE RACK.
A Plan of Rack; A′, Elevation.

Pipe Rack (Fig. 17).—Cut out the back-piece, A′, and on it glue two narrow pieces, B, B, to act as supports to the shelves, D D, which are each to have three or any uneven number of holes (for the sake of balance), the holes on the lower shelf being somewhat nearer together than those above them.

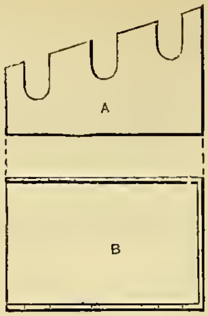


FIG. 19.—PEN RACK.
A, Elevation.
B, Ground Plan.

Brushes for Gumming, Pasting, etc. (Fig. 18).—Very handy brushes may be made out of pieces of leather, sheet india-rubber, or the like, inserted into the cleft end of a piece of wood, and retained in its position by being bound round with string or metal.

FIG. 18.—GUM BRUSHES.
A, Leather.
B, Handle.

Pen Rack (Fig. 19).—Cut the sides somewhat after the fashion shown, and mark off a line about half-an-inch parallel to the sloping edge

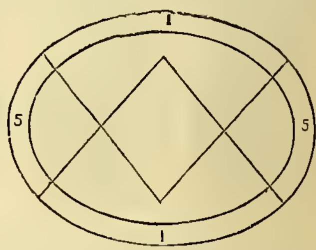


FIG. 22.—METHOD OF ARRANGING SEGMENTAL PIECES.

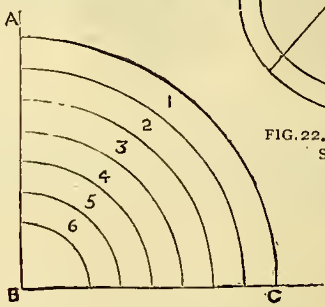


FIG. 20.—DIAGRAM SHOWING PIECES FOR ELLIPTICAL FRAMES.

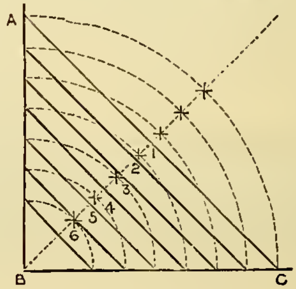


FIG. 21.—DIAGRAM SHOWING SIDES OF RECTANGULAR FRAMES.

Then mark off equal distances for the centres of the apertures, which cut out with a punch or centre-bit. Then draw lines from the sides of the circles; square with the bottom edge, which cut out to admit the pen-holder. It will be found most convenient to glue the edges of the bottom instead of the sides, as if the ends are made to fit *between* the sides, it acts as a support while drying.

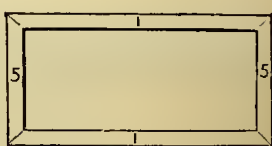


FIG. 23.—METHOD OF ARRANGING STRAIGHT SIDES.

Picture Frames (Figs. 20, 21, 22, 23).—For circular or elliptical frames,

Fig. 21, draw two lines, A B and B C, at right angles to each other, and from their apex describe circles of the width you wish your frame to be, and cut these out. For rectangular frames, proceed in the same way, the only difference being that the lines are straight. Figs. 22 and 23 show the position of these pieces when united.

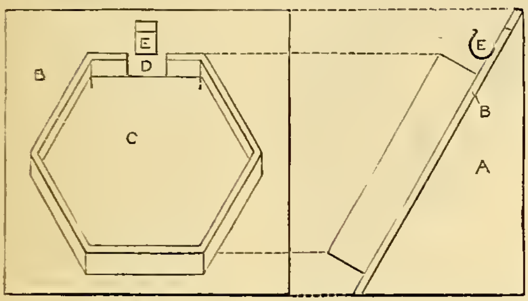


FIG. 24.—WATCH STAND. A, Supporting Bracket; B, Base; C, Hexagon; D, Slot for Bow of Watch; E, Tin Hook.

Watch Stand (Fig. 24).—Glue the longest edges of two similar triangular pieces, A, on to a base, B, and on this base in the centre fix a hexagon, C, made in the same manner as the vases (Fig. 14), except that the sides will be straight, instead of inclined. Cut out from the top side a piece, D, of sufficient width to allow for the bow of the watch, which may be hung on a hook, E, made out of a piece of tin passed through the upright piece.

(*To be continued.*)

LITHOGRAPHY FOR AMATEURS.

By H. E. GRANTHAM.

III.—TRANSFERRING, ETC.

BEFORE explaining the method of putting the transfer on to the stone, it may be as well to say a few words on the preparation of the leather tympan of the ordinary press for its future work. The dealers will put the leather into the frame if requested—so I shall suppose this to have been done by them.

Put a stone as large as the press will take into the press, and lay a sheet of paper, and a card "backing," as large as the stone, on the top of it, and finally turn the tympan down over all. Rub the upper surface of the leather freely with blacklead (such as housemaids use for blacking grates), and just a *little* tallow; work the blacklead evenly over the surface with a bit of rag, and then put a long boxwood scraper into the scraper box of the press, "run the stone" forward until the end is just fairly under the scraper, lower the side lever of the press, and adjust a light pressure; "run the stone through" from one end to the other by means of the winch handle, and it will probably be found that the scraper has stretched the leather a great deal; take up the slack of the leather by means of the nuts on the tympan frame, before releasing the pressure. The stone is run through several times with a gradually increasing pressure, until the slack is all taken up, when it is ready for use. The leather will sometimes require a little more blacklead rubbing on it but not often, only when the leather begins to look a brownish, instead of a bright black colour. In starting a job of printing, a little tallow is generally rubbed on the scraper bottom before being put into the box of the press.

The transfer being all worked, and the ink dry, prepare for transferring. Place the transfer face downwards upon a piece of clean paper, and damp the back with a damp sponge. The paper is very likely to curl up, but if carefully held down till the damp has soaked into the paper, it will lie flat, and can then be left while the stone is prepared. Give the surface of the stone a rub with a clean cloth to get any dust off, and place it before a fire or gas-stove to warm the surface. While it is warming prepare two or three soft backings of cartridge paper, cutting them to the size of the stone, or perhaps a bit larger; also prepare a card backing. Try if the stone is evenly warm by passing the palm of the hand lightly across the surface, it should feel just fairly warm, but not hot. If it is ready, place it in the press, a piece of clean paper over the surface, then the backings previously mentioned, and run through to get pressure and see if it is level. The pressure is generally about as much as can be just fairly run through with one hand. Damp the back of the transfer again, and after giving the stone another rub with the cloth, take the transfer carefully by two opposite corners, and lay it face downwards upon the stone; now place the backings over and run it through three or four times, gradually increasing the pressure till it feels fairly heavy, and requires both hands to run it through; take the backings off, turn the stone round, and damp the back of the transfer, which has adhered firmly to the stone, and repeat. Put the backings on one side, and give the transfer a *good* wetting, allowing it to remain a minute to soak in, carefully lift a corner of the paper, and gently peel it off. The whole of the ink should have transferred to the stone, and scarcely a trace be left on the paper just pulled of. Wash the stone carefully with a wet sponge until all the composition has washed off, and then the work should appear firm and strong upon the stone. Carefully examine it to see if any lines, etc., are weak or broken, and if any are found touch them with the writing transfer ink (the stone must be dry), and all having been done, take a small sponge, put a little gum water upon it, and carefully gum it all over. Now put a little printing ink on the sponge

and with rather long, not too heavy strokes, rub the work until it shows clear and black. The surface of the stone must be kept wetted with sufficient gum water to prevent the ink sticking to the stone except where the work is, and any greasy spots, etc. Leave the ink and gum upon the stone, and put it by to cool. It will make the stone look very dirty, but will all wash off except where any greasy spots should happen to be, these will catch the ink and retain it just as the work itself will.

While the stone is cooling the "acid" used in etching it can be prepared. An empty marmalade jar will do as well as anything to make it in. Fill it about a quarter full of rather thin gum water, then drop a little nitric acid into it, stir up well, and then test its strength by dropping a little close to the edge of the stone, so as to be safe away from the work that has just been transferred. If the acid turns white *at once*, it is too strong, dilute the solution by adding some more water, or if much overdone with the acid add more gum water as well. The proper strength will be attained when the acid turns white after being on the stone two or three seconds. As the action of the acid upon the stone has a tendency to weaken fine lines, it must be used with care and judgment. The damping cloth also can be prepared by taking a piece about a yard square, soaking it in clean water, and wringing it as dry as can conveniently be done *by hand*. The roller should also be looked after, scraped if necessary, and everything should be handy and ready for use.

The stone having got quite cold, place it on the press, wash the gum well off, using clean water the last time, then take the damping cloth in the hands, and having formed it into a pad rather larger than the palm of the hand, hold in the right hand, and placing it on the top left hand corner, bring it down along the surface of the stone to the bottom then carry it to the top again, but nearer the middle of the stone, and repeat until the whole surface of the stone has been gone over without the cloth having been taken off the stone. If the printer likes, he can repeat the operation going from one side of the stone to the other—in fact, stones are generally damped by the damping cloth being passed over the surface of the stone first one way and then the other. The whole surface of the stone should now *appear wet*, but it must not be so wet that the roller slips upon it. Knock up the roller upon the ink-slab and then place it upon the stone, roll forward and backwards, lift off the roller, give the hands a slight turn from you, and repeat. About three or four passes forward and back is as much as the stone will generally bear before getting too dry. The ink upon the roller will have gone more or less upon every part of the stone that contains either work or anything of a greasy nature. The damping and rolling must be repeated, until the work looks firm and black. Never roll twice in quite the same direction, always shift a little with each roll so as to get the work evenly full as quickly as possible. Now put the roller upon the ink-slab, take the sponge in the left hand and a piece of snakestone in the right, and polish off all dirt, etc., as close to the work as is safe, care being taken to keep the stone quite wet. Then take up the scraper, hold it in the right hand as if using a pen, and keeping the stone wet, scrape off every speck or line that does not belong to the work, make ragged

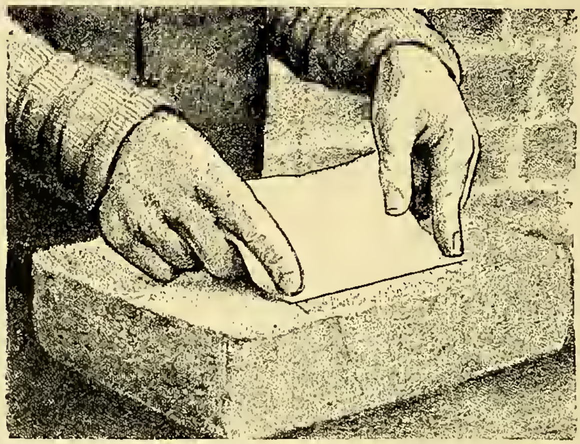


FIG. 3.—MODE OF HOLDING PAPER WHEN LAYING TO GUIDE LINE DRAWN ON FAR SIDE OF STONE: SHOWING ALSO HOW CORNER AND EDGE OF PAPER ARE ADJUSTED TO MARKS, AND HOW PAPER IS KEPT FROM TOUCHING WORK TILL PROPERLY ADJUSTED.

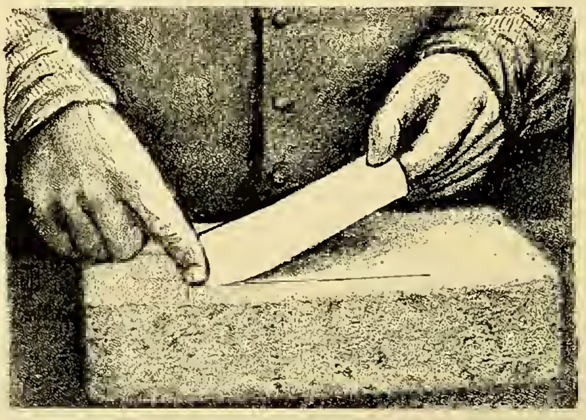
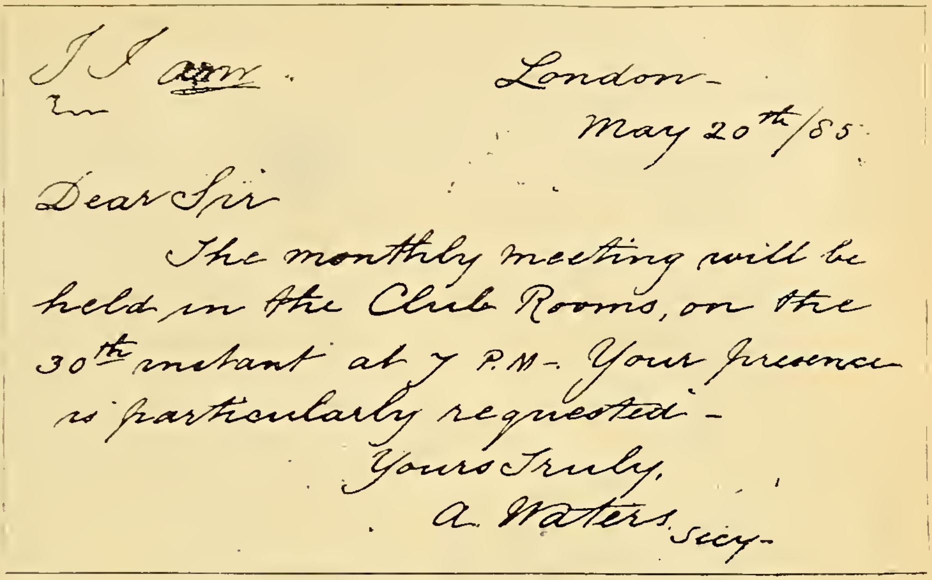


FIG. 4.—MODE OF HOLDING AND LAYING PAPER WHEN GUIDE LINE IS ON RIGHT HAND OF POINTER.



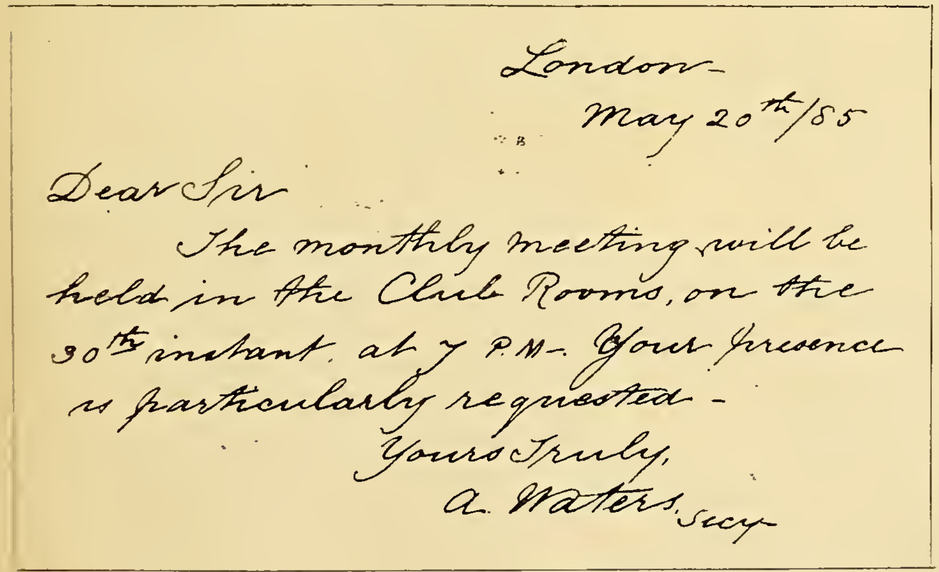
London.
May 20th/85.
Dear Sir
The monthly meeting will be held in the Club Rooms, on the 30th instant at 7 P.M. Your presence is particularly requested.
Yours Truly,
A. Waters, Secy.

FIG. 5.—FAC-SIMILE OF POST CARD BEFORE BEING CLEANED.

edges clean and sharp, and leave the work generally clean. Wash the spcnge well, wash the stone with it, damp, roll up, and take the large acid brush in the right hand; then with the pot of acid placed handy, etch the surface of the stone with bold strokes exactly as if painting any flat surface. If the acid is not too strong, allow it to remain on about a quarter of a minute, wash well off, wash the sponge *well*, damp the stone, roll up, and lay a piece of paper on the top just to get a rough pull, place the card backing over the paper, and run through with a fairly heavy pressure. Take off the backing and lift off the paper and examine it to see if it is all correct: if so, take a piece of the paper upon which the job is to be printed, and with a bit of thin "lead," obtained from a friendly compositor, mark where the two edges on the far side and the right hand will come, and with a parallel ruler rule two lines, one parallel to the work and the other at right angles to it. The lines in Figs. 3 and 4 represent the guide lines—one for laying by the edge furthest from the printer, and the other for the right hand edge.

Having ruled the guide lines, damp the stone and roll up, then try an impression properly laid to see if the guide lines are right. The guide lines are generally ruled on a damp stone, as they are liable, if ruled on a dry one, to catch the ink. It is often best to gum the stone over now with clean gum, and leave it to allow the work to soak into the stone.

In using the roller for rolling up work, care must be taken that the grip upon the leather handles is only sufficient to prevent them turning round in the hands. To roll heavily the printer



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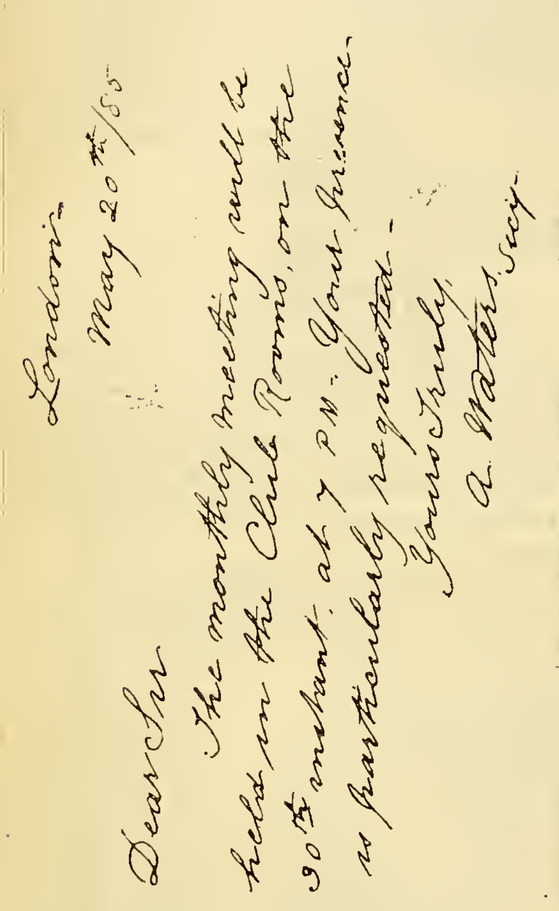
A. Waters, Secy.

FIG. 6.—FAC-SIMILE OF POST CARD AFTER BEING CLEANED WITH SNAKESTONE.
Note that by this operation all the dirt has been cleaned off, except small dots and such like blemishes among the writing itself.

presses as nearly vertically on the top, as he conveniently can, generally pressing near the end of the roller handles, *i.e.*, the wood ones. In rolling, the pressure should come in the middle of the palms or nearer the little fingers, never, as a rule, on that part between the forefingers and thumbs. The printer can then roll heavy and yet free. It is very important



London, May 20th/85

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Yours truly,
A. Waters, Secy.

FIG. 7.—FAC-SIMILE OF POST CARD AFTER BEING PROPERLY CLEANED AND ETCHED READY FOR PRINTING.
Note that small dots have been taken out with scraper, and the work left clear and sharp.

the roller should roll freely, if it does not it is liable to gradually wear the fine lines away until they no longer print, or the work "clogs" up.

In Figs. 5, 6, and 7 fac-similes of a circular in the form of a Post Card have been given, showing the appearance of work of this kind at different stages. As these stages have been indicated in the inscriptions appended to each fac-simile no further reference to them will be necessary.

(*To be continued.*)

A STRETCHER FOR TROUSERS.

By W. F. P.

ON page 344, Vol. III. of AMATEUR WORK, will be found a sketch and description of an instrument for stretching trousers, the objections to which appeared to me to be, *first*, that its length precluded the idea of packing when travelling, and *second*, that the tension resulting from the simple pull of two cords would be totally inadequate to reduce the "bagginess" of the trousers operated on: accordingly, I devised and carried out the following simple and very effective combination of lightness, strength, and durability, the general idea of which was suggested to me by the picture of the Patent Portable Trousers Stretcher, of Messrs. John Hamilton and Co., although it will be seen that my arrangement differs considerably in its construction from that capital little invention.

The tools necessary for its manufacture will be found in most amateur workshops, including a small lathe for wood and iron. The materials, also, are those which cost little or nothing, and can easily be procured.

The first thing to commence on is a round iron rod, 34 inches long and $\frac{1}{2}$ inch in diameter. The piece I used came from a damaged iron hurdle, and, after straightening on an anvil with a hammer, it answered excellently. Place it end up in the vice and cut a screw on the end to the length of 6 inches, and on this fit a square iron nut. Then reverse it in the vice, cut another screw on the other end, $4\frac{1}{2}$ inches long, and also fit a similar nut to it. This latter nut must be screwed down as far as it will go by means of a screw hammer; then square each end of the rod with a file, and drill a small hole at each end to centre it in the lathe. The bar is held in the lathe between the centre points of the mandrel and the back centre, and driven by means of the ordinary carrier and dogs. The object of mounting in the lathe is to turn off the thread of the previously made $4\frac{1}{2}$ inch screw as far as the nut, to give the bar a finish, and also to allow it to work smoothly in the upper clamp.

Not possessing a slide-rest, I had to make the best use I could of a graving tool mounted on a long wooden handle, and held tight on to the T-rest with the thumb of the left hand, as in ordinary wood turning. My lathe is the No. 2 of the Britannia Company's light-foot lathes, with an extra 24 inches of bed, and as the driving wheel has a slow speed pulley, at first I determined to use the slow motion, as in metal turning generally. Not possessing a second gut band, however and objecting to cut the one in use, I tried

the effect of turning with the graver with the lathe running at a high speed, and the result, after a few failures, was very satisfactory. I found that so long as the graver was kept steady and not held too long at one spot, it did not heat or chatter, but did its work perfectly.

Having turned down the screw till quite smooth and bright, the last shavings should be taken off, while the iron and tool are kept lubricated with soap and water ; a finish may be produced by a paste of whiting and water, or whiting and oil—putty, in fact,—applied with a rag while the iron is revolving at a high speed. If the amateur can manage it, the top face of the screw nut should also be turned up bright and square. After removal from the lathe, two parallel faces must be neatly filed at the end of the turned-up part in shape and size similar to Fig. 4, which shows a full-sized section of the joint between the iron rod and the handle. I found that the turned-up end was $\frac{5}{8}$ inch in diameter, so filed down $\frac{1}{8}$ inch each way, leaving $\frac{3}{8}$ inch of iron tongue, $\frac{5}{8}$ inch long.

The next thing to be done is to make the two clamps, which differ slightly in construction, the upper one simply having a $\frac{5}{8}$ inch hole made with a bit, while the lower one has let into it the nut which was fitted to the lower screw of the bar. Fig. 2 shows the lower clamp with the nut, of course, looking from above.

To make these clamps, take two pieces of sound evenly grained beech, 12 inches long by 1 inch by $1\frac{1}{2}$ inch when planed up. On the $1\frac{1}{2}$ inch face of one piece draw out a curve similar to the one shown in Fig. 2, and cut down nearly to this line with a key-hole saw, and finish off with the spokeshave. Then from the first piece the second curve can be marked out. When these two pieces are got out, take two pieces 12 inches by 1 inch by $\frac{5}{8}$ inch when planed up, and neatly bevel off the lower edges and both ends, as in the figure. Next, bore and tap holes right through the smaller pieces to receive the wooden thumb-screws, and bore corresponding holes slightly larger in diameter in the larger pieces, so that the screws may play loosely in them, and so admit of the clamps being tightly screwed up. Lastly, bore a $\frac{3}{8}$ inch hole very carefully through one clamp, to admit the turned end of the rod, and a $\frac{1}{2}$ inch hole through the second or lower clamp, and let in the nut flush with the face, as in Fig. 2. Rub down all the faces of the clamps with 1 size glass paper, being careful not to rub off the edges too much.

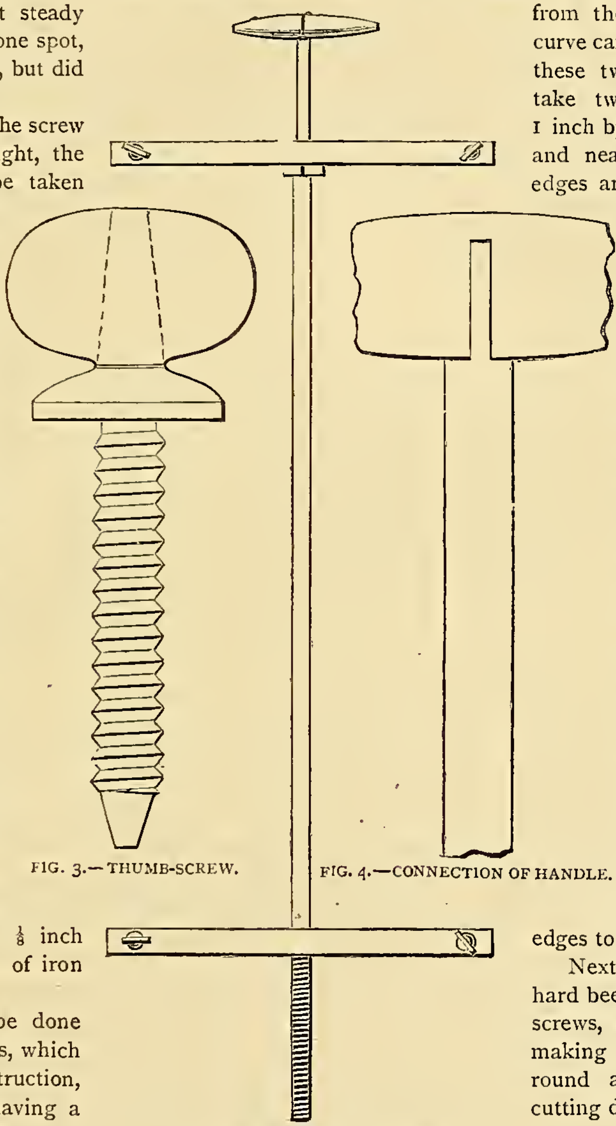


FIG. 1.—TROUSERS STRETCHER, COMPLETE.

FIG. 3.—THUMB-SCREW.

FIG. 4.—CONNECTION OF HANDLE.

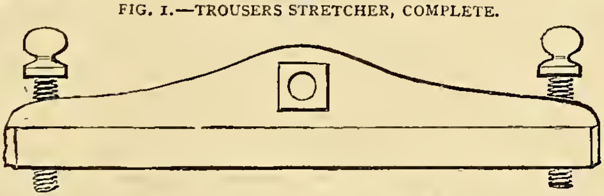


FIG. 2.—LOWER CLAMP, SHOWING NUT.

Next take some pieces of hard beech, and turn the thumb-screws, as in Fig. 3 (full size), making the ends or handles round at first, and afterwards cutting down with the tenon saw, as in the dotted lines ; the faces of these handles may be left flat, or may be scooped out with a gouge, in either case being finished by means of fine glass paper and scraping. The wooden screw is, of course, cut with a die box corresponding to the thread cut in the ends of the clamps. When the screws are found to work easily, all tha remains to be done is to make a handle with whi

to turn the iron rod. I made mine of some African black wood, which I happend to have, and mortised the necessary hole, so that the tongue formed on the end of the rod fitted easily but not loosely into it, as in Fig. 4. The whole thing, when put together, appears as in Fig. 1. A little Brunswick black applied to the unturned part of the bar gives a finish to it. It remains only to say that Fig. 1 is one-sixth size, Fig. 2 is quarter size, and Figs. 2 and 4 are full size.

NOTES ON NOVELTIES.

By THE EDITOR.

43. ZILLES' A 1 FRET-WORK, CARVING, AND INLAYING DESIGNS.

I HAVE next to nothing to write about with respect to novelties this month, I am sorry to say. So after I have touched on two or three things that I am bound to notice, I will take advantage of the opportunity to make a few remarks on some points connected with "Amateurs in Council," to which I request the attention of my readers. And now to business without any further beating about the bush.

43. ZILLES' *A 1 Fret-work, Carving, and Inlaying Designs.*—Mr. Zilles writes:—"I have sent you by this post some of my A 1 Fret-work, Carving, and Inlaying Designs, which I have only recently received. They are the best I have, and I am selling them at 1s. per sheet. Besides the eight sheets sent, I have A 1 designs for a Self-acting Water Mill, in the Swiss style, and a Baby Room and Furniture (as per enclosed illustration), in the Renaissance style." Mr. Zilles' baby room is what we should call a doll's house. The sketch spoken of shows it to be a single room with curtained recess containing casement window and seats, door with overdoor, clock, sideboard, tables, chairs, vase with palm branches, pier-glass over waggonette, etc., the whole forming a pretty interior which any child would be glad to have. The designs that are sent are all first-class in their way. They comprise—(1), a Gothic Castle, with full-sized working drawings of all its parts, a capital piece of modelling for those who like light carpentry of this kind, contained in two sheets; (2), Two Frames, one for a mirror and the other for a photograph, in one sheet; (3), a Stand for a thermometer, small easel, stand for a block calendar, and a clothes rail, in one sheet; (4), an Inkstand for an escretoire, and miniature console, in one sheet; (5), Two Baskets or Vases, one hexagonal and the other octagonal, in one sheet; (6), a Cornice for Curtains, a border for a table, and a rosette in inlaid work, in one sheet; and (7), a Casket in carved work, in one sheet. Thus in the eight sheets there are one design for modelling, ten for fret-work, three for inlaying, and one for carving. The execution is bold and free, and the design is in every case attractive. I can recommend these sheets to my readers.

I have received the "Journal of Microscopy and Natural Science" for April, and "The Journal of Decorative Art" up to date. As I have already described the nature of those useful periodicals, the one a quarterly and the other a monthly serial, I need say no more than that the current parts amply sustain the reputation they have gained in those circles for which each is especially prepared.

And now with regard to "Amateurs in Council," this part of the Magazine has advanced in its growth considerably beyond the extent that was originally anticipated for it, as the giving of twenty-four extra pages in the present volume up to this time, in addition to the pages devoted to it in the Magazine amply proves. This has arisen partly because correspondents, in some cases, ask for information which cannot be compressed into a small space, and which should rather be treated in the form of a short paper, in order to render it as useful as it ought to be, and partly because valuable communications from writers chiefly respecting their own personal experience in matters of doing and making have been introduced therein, with the hope of economizing space as much as possible. For the future these communications, forming as they do brief and interesting papers on ways, modes, and means of accomplishing certain ends, aims, and purposes, will be grouped together under the general title of "How It was Managed: A Series of Practical Hints, Suggestions, and Wrinkles from Amateurs for Amateurs." With reference to paperettes for this department, and indeed for Amateurs in Council generally, I must ask all correspondents, without exception, who write to me after the date of this Part, to observe with the utmost strictness the following rules:—

1. *Write on one side of the paper only, and when asking questions or answering questions in "Amateurs in Council," still write on one side of the paper only.*

2. *When illustrations or diagrams are necessary, draw them on a separate piece of paper, because the "copy," as the manuscript is technically called, has to go to the printer, and the illustrations to the engraver.*

3. *Abstain from the epistolary form, as it is utterly unnecessary, unless in letters of business. Put the question you wish to ask, or the reply you wish to make, as briefly as possible, and write every separate question and every separate reply on separate pieces of paper. Sign each with initials, nom-de-plume, or name and address, as preferred.*

4. *Let every paper be headed* AMATEUR WORK, *and follow these words with* "Information Sought," *when it is a query;* "Information Supplied," *when it is an answer to a query; and* "Sale, Purchase, and Exchange," *when it concerns anything to buy, sell, or barter.*

5. *It must be fully understood that no attention will be paid to any letter or communication in which these rules are not rigidly observed.*

I trust that these rules will be all the more noticeable because they appear in larger type than that of "Amateurs in Council." In future they will be repeated under the heading of this portion of the Magazine, that no one may be able to plead ignorance of them. The adoption of them will tend to lighten the clerical work connected with the Magazine, because correspondents will then be doing what I am now compelled to do for them.

AMATEURS IN COUNCIL.

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine, the information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

Violin Making.

G. F. H. (*Limerick*) writes:—"Having through the kind favour of Messrs. Broadwood obtained some magnificent wood, I set to work and made two violins from the model published in AMATEUR WORK—the 'Guarnerius' belonging to Mr. Sainton. The result has far surpassed my most sanguine expectations. The model is a beauty; my copy has a clear, sonorous, brilliant tone, very free to play upon, quality of tone like a clarinette, all strings equal in power. I cut the *f* holes roughly with a fret saw, and found a rasp bent into a good curve very useful in shaping inside of belly and back. As I could not procure an oval plane, I shaped up a round moulding plane (1 inch) into the curve required, it answered well. I found the hints furnished by one of your correspondents about screws for clamping on belly and back, first rate. The varnish I procured from Mr. Hill, 72, *Wardour Street, Soho*; it is splendid, clear, and dries quickly. I feel it only right to thank you for the pleasure I have derived from following your valuable instructions. It would afford me pleasure to show the result of my work to any one who would care to see it." [You should show your violin at the Inventions Exhibition. It would be interesting to many, if amateurs, who have made instruments from instructions in AMATEUR WORK would do this.—ED.]

Book on Toy Making.

AN ENQUIRER.—A book on this subject, entitled "Toys and Toy Making," by James Lukin, B.A., is published at the "Bazaar" Office, 170, *Strand, W.C.*, price 1s. 6d.

Writing Desk.

T. W. H. (*Openshaw*).—You will find instructions for making a writing desk with diagrams, in page 403 of Vol. II. of this Magazine (Part 19, June, 1883), and a design and instructions for making a useful paper case in page 88 of Vol. III. (Part 25, December, 1884).

Cutting Mounts.

C. H. (*Great Yarmouth*).—It is not possible for me to say precisely when the promised paper on Mount Cutting will appear, but certainly in the present volume.

Substitute for Screw Press.

WAITO.—You will have seen before this reaches you that the correction you send has been already made. This is in acknowledgment of your letter.

Supposed Erratum.

H. W. (*Newton Abbot*).—I am much obliged to you for the correction you send, but you are yourself in error. The side of a hexagon is equal to half diameter of circle in which it is inscribed. Therefore, if you take with the compasses the length of any side of a regular hexagonal vase, to which you wish to make a bottom, and "with this distance" describe a circle and inscribe a hexagon in the circle thus drawn, the hexagon will exactly fit the bottom of the vase.

Incandescent Lamps.

FLASHING DYNAMO.—Incandescent lamps furnished with platinum filaments are always liable to disruption of the filament from a slight increase of current. Such lamps also consume more current than those furnished with carbon filaments. Lamps with carbon filaments vary very much in quality. Such well made lamps as those furnished by the Swan United Company, Messrs. Woodhouse and Rawson, the Maxim-Weston Company, and other well-known makers, will run, with ordinary care, for periods of 800, 900, and over 1000 hours.—G. E.

Makers of Model Engines.

W. P. B. (*Edinburgh*).—You may address a letter to Mr. John Bateman, who supplies the component parts of Model Engines, at 131, *High Holborn, W.C.*, or 117, *Fleet Street, E.C.* Messrs. W. and F. Hamley, "Noah's Ark" Scientific Depot, 231, *High Holborn, W.C.*, also supply Model Engines. I do not know the other maker you name in your letter, so I cannot give you his address, nor can I undertake to say "whose *castings* of model engines I consider the best and easiest for an amateur of ordinary experience to make up." From what I have seen of those that are offered for sale by the above makers, they appear equally good in quality, etc., but then I, myself, am not a model engine maker, so my opinion, perhaps, is not worth.

Astronomical Telescope.

A. F. S. (*Dresden*).—It seems marvellous that any reader of AMATEUR WORK could expect me to answer such a multiplicity of questions (fourteen), or that the editor would occupy his space with about two columns of replies to queries which would be of no value except to one person. My recommendation to you is to study the science of optics, and you will then be able to answer most of your queries, which are of any importance. Concerning the purchase of lenses and of a dark glass, I cannot say definitely where they could be procured, but should think any large optician would be able to provide you with them.—F. A. E.

Horse Power of Otto Gas Engine.

BARDOLPH.—An Otto ½-horse power nominal will frequently give a power of 1·1 horse-power indicated. Yes, the rule for calculating the horse power of engines is, as you state, viz.: Multiply area of piston in square inches by average pressure on piston. Multiply this by the number of feet traversed by piston per minute, and divide the product by 33,000. This will give the horse power per minute. As the effective pressure on the piston of a gas engine depends upon the quality of the gas, the component parts of the explosive mixture and the arrangements for compressing the mixture, one cannot calculate the horse power of such an engine without knowing the above-named particulars. The makers can, however, give you nearly all you require to know about your own little engine. The mixture of gas and air is usually 1 in 11 or 12. The consumption of gas 25 cubic feet per horse power per hour.

Clock Making.

A. H. writes:—"We have had for some time past, astronomical regulators made and supplied in parts, finished and unfinished, by one of our leading scientific horologists of the day, every part of the movement complete, without the case, if thoroughly finished, the parts are gilt and polished, pallets jewelled, other jewels at so much each pair extra, pendulums, gridiron, mercurial, or wood rod. The movement, finished, without pendulum or case, from £10 to £12 10s. Should our amateurs in clockwork feel competent to undertake clock finishing, I can supply the parts required at the manufacturer's prices, and give some instructions from time to time on the finishing of the clock. I can also supply parts for models of watch escapements, clock work size, which would cost less to commence upon; price of these from 23s. to 27s., with stand and glass shade. The lowest price for the astronomical clock parts in the rough, everything but the case would be from £4 10s." [Will A. H. send me his name and address so that I may be able to refer inquirers to him?—ED.]

Le Page's Fish Glue.

I. L. M. (*Aberdeen*) wishes to record his testimony in favour of Le Page's Fish Glue. He says, "I have found it, in the occasional work I do as an amateur, simply invaluable. I have tried almost every kind of 'liquid' glue before, but found none of them of any value whatever." [Like yourself, I find it invaluable, especially for small work, and on no account whatever would I be without it.—ED.]

Lathe Chucks for Amateurs.

L. S. C. (*Derby*).—The first and second of the series of papers, entitled, "Lathe Chucks for Amateurs," appeared in Parts 26 and 33 of AMATEUR WORK, bearing date respectively, January and August, 1884. The present volume commenced with Part 36, dated November, 1884.

Small Still.

W. T. W. (*Bristol*).—The description of a cheap still, such as you may make for your own amusement, is given in "Electro-plating at Home," Chap. III., in Part 3 of AMATEUR WORK, dated February, 1882. You will also find two designs for stills in Vol. III., page 494, Part 33, August, 1884. The cost would be but small for any of them, perhaps 2s., or 2s. 6d. at the utmost.

Paste that will not Mould.

H. B. writes:—"I find that if about one-eighth oz. of carbolic acid be dissolved in a pint of water, and paste made with this and 4 ozs. of flour, it will keep *for years* without moulding. A smaller quantity of Carbolic would probably do, and would discolour the paste less, but I have not yet tried less."

Hartford Drill Chuck.

R. B. H. (*Bristol*).—I am obliged to you for your letter, but I do not insert the particulars respecting the Hartford Drill Chuck, as any one who wishes for them can obtain them direct from Messrs. C. Churchill and Co., 21, *Wilson Street, Finsbury, London, E.C.*

Where to Purchase Veneers, etc.

NEPENTHE writes:—"I wish to record most generous treatment from Messrs. Hudson & Carr, of *Endell Street, Long Acre*, who, alone, out of several firms addressed, responded to my request for a small amount of veneer, with which to revive an old cabinet, sending promptly more than enough for my need, well packed and at small cost. I wish heartily to commend them to amateurs."

H. G. W. (*Canterbury*).—As to where to buy veneers see what NEPENTHE says above. Detach a small piece of oak veneer from your chest of drawers and send it to Messrs. Hudson & Carr, *Endell Street, Long Acre, London, W.C.*, with a request that they will send you some to match it as closely as possible. Cut out the broken parts so as to leave a clean and straight edge, then cut pieces of exactly the same size to glue into the spaces to be filled up, and when dry scrape and polish, or varnish the whole piece of furniture. You will find instructions on veneering in "Jointing Wood in all its Branches," pages 112, 158 and 220 of Vol. II., and directions for polishing in "French Polishing in all its Branches," in pages 79, 206, 262, 363 and 406 of Vol. III.

Brass "Queen Anne" Furniture for Chest of Drawers.

H. G. W. (*Canterbury*).—You ought to be able to get this at any good ironmonger's in your own town. If you cannot satisfy yourself there write to Messrs. R. Melhuish & Sons, 85 and 87, *Fetter Lane, London, E.C.*, telling them what you want.

Launch Engine and Boiler.

S. M. L. (*Goderich, Canada*).—The dimensions you give are very small for an engine of that class, too small in fact to be practicable. You would, of course, require a condenser, and the details of that alone would prove formidable. $1\frac{1}{4}$ inches by $1\frac{1}{2}$ inches and 2 inches by $1\frac{1}{2}$ inches would be better, but I would advise you to let the compounding "slide" on the sizes you give. If each cylinder was $\frac{3}{4}$ inch bore and worked high pressure, non-condensing, you would get a good result with a boat about 3 feet long, 6 or 7 inches beam and about 4 inches deep, moulded with fine lines forward, or in other words "sharp about the bow." Boiler should be horizontal, of the form already given by me in reply to another query of yours, made of copper, joints riveted and soldered, with flat surfaces stayed, you could carry 30 pounds of steam. Diameter $3\frac{1}{2}$ inches to 4 inches, length about 6 inches. If charcoal is burnt put the furnace door forward. Before getting up steam test the boiler by hydraulic pressure to twice the working pressure. You will then have a factor of safety of at least two. Horizontal form preferred to vertical, on account of centre of gravity being lower in the boat. For engine 1 inch bore and 2 inch stroke vertical boiler 5 inches outside diameter and 9 inches high, made of copper $\frac{1}{32}$ inch thick. Working pressure about 20 pounds. Plenty of engines are made with bore greater than stroke, especially marine. Plunger for pump for above $\frac{1}{8}$ inch diameter of same stroke as engine, but $\frac{1}{4}$ inch diameter if $\frac{1}{4}$ inch of engine stroke and worked by eccentric. If the pump is independent of the engine, and worked by hand, as some are, then let it be $\frac{3}{8}$ inch or $\frac{1}{2}$ inch in diameter, and about $\frac{3}{4}$ inch stroke, worked by lever. I hope the foregoing may be of assistance. I shall be happy to assist further if required. In writing, please state your case very fully, by so doing time will be saved in obtaining replies.—OLLA PODRIDA.

Home Made Furniture.

SOUDAN.—I have other articles by PITCH-PINE on this subject awaiting publication in due season.

My Furniture, and How I Made It.

CURIOUS CHIP CUTTER will find further explanation of details in my "Strong and Simple Home-Made Furniture," Vol. I., page 455. He is thanked for the emendation of base of dressing-table, but in adopting it would not more be lost in strength and simplicity than would be gained in appearance?—M. M.

Paste for Mounting Photographs.

A. W., the following is a good preparation for mounting photographs: $1\frac{3}{4}$ ounces Bermuda arrowroot, 80 grains gelatine, and 14 ounces of water. Soak the gelatine in the cold water for two or three hours, then add the arrowroot, which should first be made into a paste with a little of the water, boil for five minutes, and when partially cold add 1 ounce methylated spirit and 6 drops carbolic acid, stir well and leave to cool. When many prints have to be mounted, however, nothing beats plain boiled starch, the prints being wetted and pressed preparatory to using the starch. —J. P.

Removal of Photograph from Mount.

STRAWBERRY.—To remove photographs from their mounts soak in cold water until they come off; this they will generally do in about twelve hours. If the mount is very thick it may be peeled away at the back after an hour's soaking, then returned to the water and the peeling process repeated after another hour, and so on.—J. P.

Caustic Potash and Zinc White.

J. S. (*Edinburgh*).—The action of caustic potash on zinc in the cheap electric bell battery produces zinc oxide or zinc white. This is used by certain paint-makers as a substitute for white lead, but I do not know how it is prepared by them for the purpose. Unless a person uses a large number of Bennett cells, the collection of this to sell would not pay the collector. The caustic potash sold in sticks can be used, but is more costly than caustic soda, whilst the latter will serve your purpose.—G. E.

Harp Making.

DOLCE.—I have no space to devote to this subject. I gave publicity to the request of W. B. R. (*Southsea*), for the dimensions of a harp, but, on account of the metal work that is necessary I do not think that either you or he would be successful in making one.

Hydraulic Motor for Organ.

F.—If you make the motor to the dimensions given, using thick sheet lead ($\frac{1}{8}$ inch) for the buckets, or lead castings about that thickness, increasing the size of the inlet and supply pipe to 1 inch, also the outlet in proportion, it will be quite powerful enough for your purpose. The quantity of water it will use will be the quantity which will flow through a pipe of the size mentioned, or any other size you may use, with the pressure at supply tank taken into consideration—a calculation you can make as easily as I, with perhaps more time at your disposal for such work than I have.—CATO.

Electro-Motor.

R. D. Y. (*Portsmouth*). — You say you are making a small electro-motor which you propose to work with a bichromate battery. The magnets are of the horse-shoe form, the legs being $\frac{3}{8}$ inch in diameter and the bobbins $1\frac{3}{8}$ inches by $\frac{7}{8}$ inch, and you wish to know what size wire should be used to wind the bobbins. To this I reply:—Use No. 20's and 22's copper, either silk or cotton covered wire. The bobbins are hardly large enough in diameter. To get the best effects they should be $\frac{1}{4}$ inch or $\frac{3}{8}$ inch larger, so that the wire, when wound, will be as deep as the diameter of the core.—LEBASI.

Labels on Metal.

BING writes:—"I beg to hand you herewith sample recommended by me in Vol. III., page 46, for your inspection. This was affixed towards the end of 1882 with ordinary paste on a quarter pound mustard tin. There is not much appearance of coming off easily."—[The paper label, made of very common paper and written on with ordinary ink, adheres so firmly to the tin plate that it can only be removed by scraping. I bent the plate in every direction without disturbing the paper, and at last by bending backwards and forwards till my object was effected, broke it in two. The paper parted with the metal still sticking to it and showing only a ragged edge along the line of division.—ED.]

Wrinkles in Pictures.

H. G. W. (*Canterbury*).—To prevent "curling," or rather wrinkling in pictures after framing, the best way is to mount them on cardboard before you put them in the frames. The chance of any injury from the moisture in the paste used in pasting brown paper at the back of the frame is then reduced to a minimum. It is possible that the curling, as you call it, is caused by the dampness in the air of the room in which they are, but of this you will be the best judge.

Lalande-Chaperon Battery.

LALANDE. — The Lalande-Chaperon Battery is one of the single fluid type without porous cell. The outer containing jar may be of iron, and may be made to do duty as the negative element of the battery. A layer of oxide of copper on the bottom of this vessel forms the depolarising element. This is covered with a concentrated solution of caustic alkali, in which is suspended a massive plate or lump of zinc to form the positive element. The cell is then sealed to exclude air. Its construction is therefore similar to that of the "Cheap Electric Bell Battery" recently described, but its power and constancy is superior. Oxide of copper is prepared by roasting copper scales and turnings in the open air. Its cost is 1s. per pound. All other ingredients are cheap.—G. E.

Gus Rochefort's Frames, etc.

J. H. H. (*Eaton Square*) writes:—"I trust you will excuse my appeal, but having through the recommendation of your valued paper paid Mr. Gus Rochefort, of 29, *Basinghall Street, E.C.*, a visit, I was glad to find all you say true. I have been buying, for the last twenty-five years, goods for my brother and numerous friends in Bombay and Melbourne, and of course know by this time the cheapest houses, but was astonished at the difference of price and quality of his goods—quite fifteen per cent. cheaper than I can get of any house; not only that, but you can place every confidence in him as regards getting good goods. I have found in many cases when I have bought goods of various houses, and not seen them packed, they have sent an inferior article, but with Mr. G. R., I merely mention what I want and am perfectly satisfied I get the proper sort, or am informed of this not being in stock. I should be glad if you can find a corner in your valuable paper for extracts of this as I feel certain it would be a boon to some of my co-foreign buyers who have no time to spare to know of a house they can place every confidence in.—N.B. Send for his shipping illustrated list. — [I have much pleasure in giving publicity to this communication from an officer in Her Majesty's Service, and in saying that I am sure that all who purchase of Mr. Rochefort will be well served and rest contented with what they get.—Ed.]

Silicine Glass Painting.

A. C. J. (*Whittlesford*) writes:—"I have tried the Silicine Glass Paint mentioned by you in Notes on Novelties, page 94 of this volume of Amateur Work. I think my experience may be of use to amateurs in general. I broke the moving glass of a valuable slide for a magic lantern (one of Carpenter's, a train passes over the Irwell viaduct and wild ducks swim in the water below), and being a rather neat etcher and flower painter in miniature, I resolved to repaint the train and ducks myself. I have helped in painting a glass window (church-diaper pattern), and dreading the worry and annoyance of burning in colours, I rejoiced to see your notice. I sent for a bottle of medium and tubes of dark brown, blue, and rose. With glass cut exactly to size and well cleaned without scratches, I laid on first the browns, let it dry for a day or two; then the blues, let it dry; then the rose, let it dry, and then put fine dark lines as finishing touches to the outlines. These lines I used a magnifying glass for, as a slight wavering would show to disadvantage when reproduced on the wet sheet. When drying it lay in an empty room where there was no dust, and I kept the door locked. I then left it four days to dry and fitted it to the slide, but my picture began to rub after moving it backwards and forwards a little time. I then wrote to Messrs. Beissbarth Son, and received by return of post a civil and obliging letter from them and a bottle of 'gloss.' I need only add that my slide now works as well as ever, and I think it would require an expert to discover that the paint is not of the same sort as the rest of the picture. I send you the piece of glass that I used as a palette, to show the clearness of the simple paints and mixtures, and scrap with two ducks painted on it as in my slide."—[The colours are excellent, and the painting as good as the colours.—Ed.]

Lunt's New Registered Cutting Gauge.

Aqua writes:—"In page 196 of this volume of Amateur Work, you have a notice of a new gauge by Mr. A. S. Lunt. The moment I saw it I said it was a very good idea, but it had one fault, and to prove this I set to and made one for trial, and the fault is this, that the cutting or marking point is at the wrong end of the stem. According to your illustration of gauge, by working it from you, which is the usual way of using gauges, the stem would run slack, but with the cutter or marking point in the other end it would run tighter. With this slight alteration it will make it a very handy bench tool both for tradesmen and amateurs."—[I fail to see the force of your reasoning. I always work a gauge towards me and not from me, but then I am an amateur only. I find Mr. Lunt's new gauges work very well.—Ed.]

Management of Paint Brushes.

A. F. S. (*Dresden*).—Your brushes are either very inferior ones or you do not treat them properly. If a brush is allowed to remain dry for a great length of time the hair will in all probability come out. Always soak a new brush in water before using it, and when you have done with your brushes clean them and put them away carefully. You may get some useful advice on this subject from Mr. Edwinson's papers on "House Painting and Papering," in Amateur Work.

Rosette Cutting with Bit.

Chacka writes:—"A few years ago I was in one of our colonies, and calling upon a friend of mine, who was a waggon builder, I found him in his workshop putting the finishing touches to a colonial waggon; and noticing an ornament, which appeared at first sight to be a small turned rose inserted into the side of it, I asked him how that had been done, as it seemed to be quite impossible to have turned it in a lathe. 'Oh!' he said, 'that was done by a very simple plan You know we have to work in hard and tough wood, and we occasionally damage our bits. When this happens I take a small file and make the cutting part so that when worked with the brace it forms a rosette; a touch of sandpaper and the finish of paint makes it what you see.' I noticed that a small peg of wood was put in where the centre of the bit worked, and the result was quite ornamental, being repeated at intervals along the side of the waggon. I have thought that this hint might be improved upon by some of the ingenious readers of Amateur Work."

Cheap Electric Bell Battery.

Amateur. (*Esholt*).—Any caustic soda will do for the purpose. Highest qualities are best. Let the solution be as strong and pure as can be obtained. It is not necessary to make the caustic alkali as described. That information was given for the benefit of poor amateurs who could not buy caustic soda.

Cases for Toilet, etc.

W. A. de N. (*Finsbury Park*).—Articles on clothing suitable for emigrants, etc., are not admissible in the pages of this Magazine, but you may send a paper on the method of making toilet cases, haberdashery, etc., on your plan. Articles on working in leather, otherwise than boots and shoes, *i.e.*, on making straps, saddlery, harness, leather cases, knapsacks, valises, etc., will be looked after as soon as any writer who is competent to deal with the subject offers his services.

An Architect's Chances.

Bardolph.—If you are likely to make £300 to £400 a year by working at your father's business, my advice to you is to stick to it. The profession of architect offers a good prospect to young men whose tastes lie that way, but in these days of competition a man's ability in this direction must be above par to excel and get well in advance of others in the same vocation. I can say nothing about the £ s. d. side of the profession. Pecuniary rewards vary in every calling, and by no means go entirely by merit. You might make a large income by adopting the profession and you might not. It mostly depends on yourself and your aptitude for the vocation.

Medical Coils.

H. A. S. (*Tunbridge Wells*).—An illustrated article on "Induction Coils" appears in this Part, and in it some of your wants will be met. To get the primary current alone connect the handles to the break and to the battery stud, or carry branch wires from these parts to two special studs for the purpose. A water regulator is made with a glass tube filled with water, stopped at both ends with corks, in which slide platinum wires connected with the coil. Space cannot be spared for further details here, but the subject shall receive attention in a future part.—G. E.

W. L. N.—You desire that which is unattainable. Small medical coils must be worked with current from a battery or some other similar source of electricity. The induction coils about to be described will give you some idea of the skill required to construct a medical coil, the construction and coil being similar. A Magneto-Electric Machine, constructed to generate electricity and give shocks from its own coils, was described in Vol. II., pp. 551—556, Part 22.

Electric Light Plant for Workshop.

Bardolph.—If you will communicate with Mr. H. Jones, 48, *High Street, Lambeth, S.E.*, you will learn the cost of a complete outfit for your workshop. Send him the area and height of the shop, and he will then advise you as to the best lamps and machine for working them. If you wish to make up your own machine he will supply you with castings and all necessary parts. Your engine might furnish enough power for a 500 candle arc lamp or ten 20 candle incandescent lamps, but much will depend upon the dynamo machine, and all small machines are liable to variation. Also, unless sufficient engine power is provided, and a margin left over for contingencies, the light will be unsteady with the full number of lamps in circuit

Telegraph Instruments.

UMBRIA.—An illustrated article on the subject shall appear as soon as convenient to author, editor, and publisher.—G. E.

Fly Wheel for Lathe.

NEPENTHE.—Yes, the lathe would certainly be improved by the means you propose. You may carry out the alterations in three ways: First, by replacing the fly wheel with a new and heavier one; second, by adding another fly wheel; third, by clamping or bolting weights to the rim of the present one. If the second alternative is adopted, the additional wheel should be fixed close to the present one, and, if possible, should be larger in diameter. If the third case is more suitable to your convenience, care must be taken to balance the wheel properly. The first method would be the neatest in appearance, but would be more expensive than the others. If the foregoing is insufficient, I shall be most happy to furnish further information should you desire it.—OLLA PODRIDA.

Covering Wire.

FLASHING DYNAMO.—It would be necessary to have a special machine for the purpose. I could give you full illustrated instructions on making the machine and covering the wire. The covering machine need not be an expensive affair, but I think it would not pay an amateur to make his own machine and cover his own wire. Of course, I now write of the amateur mechanic—English, French, or American—who is living where covered wires can be purchased or sent to him. I am connected with a firm making it a part of its business to cover large quantities of wire. We can make the business pay by doing large quantities, and buying raw material by hundredweights, but it would not pay us to cover small quantities at a time. I do not dissuade you from attempting the job because I am connected with the business, but because I know all that can be said for and against the attempt of amateurs to cover their own wire.—G. E.

Willesden Waterproof Paper.

R. C. C. writes in answer to ENQUIRER, page 303:—"I have now on the stocks, and almost ready for launching, a Nautilus type double paddleable sailing canoe, 16 feet 4 inches by 2 feet 6 inches, which I am building from Mr. W. Baden Powell's excellent design given in 'The Field,' for January 31st, 1880. I am using for the skin, Willesden Waterproof Roofing Card, four ply, B. 1-80, and have every reason to believe that it will be a good boat for lightness, strength, and durability. The roofing card, or waterproof paper, is sold in widths 54 inches to almost any length. The thickness I am using is about $\frac{1}{32}$ of an inch, and is, I think, strong enough for the purpose, as a piece nailed on a wooden frame with a hollow 1 foot square will not give way if trodden, or even jumped upon. It is not very flexible, except in its length, but, of course, it is far more flexible than wood. To plane the surface would be folly, as it would spoil it, to plane the edges, waste of time, as it is better and much neater and quicker to cut it with a sharp knife or pair of scissors. It is far less liable to split (or its equivalent, *tear*, for it does not split) than ¼ inch cedar, pine, or mahogany, provided that the nails are not too wide apart; I have placed them 1½ inches apart. I believe neither sun nor wet will affect it, which will be a very great advantage over any kind of wood. The price is about 2s. 9d. per yard, 54 inches wide. The ribbon carvel plan of building should be used, but ENQUIRER will probably find, as I did, that it is too difficult to cut the edges accurately enough to lie close, and that he must clincher build it over a ribbon carvel batten, *i.e.*, overlap edge of upper and under piece, and drive one row of nails through upper and under pieces, and through ribbon of wood running inside canoe, and clench. It is necessary to have two wooden streaks each side of keel, to prevent keel warping, the 'paper' not being strong enough to prevent it. The ribs should run from gunwale to gunwale, *i e.*, the two side ribs should overlap keel rib, and be nailed to it, this makes the boat perfectly rigid. I have built my canoe on two bent ash flanges at midships, which are bolted together, with india rubber joint between, this will enable me to divide canoe, and more conveniently send it by train. I built a canoe on same lines, of pine and mahogany, some years ago, and have been hundreds of miles in her, and she is still sound. I shall be happy to give ENQUIRER any further information by letter, if he will write to me through the Editor, who has my address."

Threshing Machine for Corn.

AMATEUR.—There may be a possibility of describing the mode of making a threshing machine and other agricultural implements at some future time, but certainly not at present. I am afraid, too, that it would be beyond the power of amateurs to make these articles effectually.

INFORMATION SUPPLIED.

Amber for Varnish.

F. A. (*Gainsborough*) writes in reply to W. B. (*Gainsborough*):—"Amber can be obtained from or through Mr. Clarkson, Chemist, *Gainsborough*. I don't know the price. Naphtha is the best solvent for amber, and is sold at 1s. per pint. I reside with Mr. Clarkson; if W. B. would call on me we might help one another."

Varnish Hardening.

F. A. (*Gainsborough*) writes in reply to J. B. (*Stonham*):—"Spirit varnishes evaporate very quickly if not kept tightly corked. Varnishes should always be strained. Why use rectified spirit when methylated spirit will do just as well, and is only one-third the expense. The varnish you have made may be dissolved in rectified naphtha, and will come in for commoner work."

Splicing Wire Ropes.

OLLA PODRIDA writes in reply to A. W. W. (*Gateshead-on-Tyne*):—"Splice with a 'long' splice, same as hemp or Manilla rope, using a sharp pointed steel marlin-spike. Wire-cutting pliers will be required in finishing off the ends of parts."

Battery for Electric Clock.

CASENHEM writes to M. C. (*à Condé, France*), page 149:—"The battery I use for my clock (of French workmanship, by Detouche) is a modified form of Daniell, and introduced into England by Varley as 'The Gravity.' It consists of a glass jar 35 centimetres high by 20 centimetres in diameter. A spiral of copper wire rests on the bottom, with an insulated wire (a gutta percha covered copper wire) leading outside for the positive pole. On the top of the liquid is a cone-shaped piece of zinc, suspended by a wire put through it, and supported on the edges of the jar. The solution consists of sulphate of magnesia (Epsom salts), 100 grammes to 1 litre of water, and 2 kilos of sulphate of copper put in, and lying on the copper spiral. To prevent endosmose and evaporation, I pour on the top of the liquid half a litre of paraffin oil. Of course, this form of battery may not suit your clock, owing to its internal resistance being so low. The coil of my clock is only 5·7 British Association Units resistance."

Water Glass: Where to Buy it.

CASENHEM, in answer to C. T. S. (page 152) says:—"You should have no difficulty whatever, in France, in purchasing silicate of potash, as it is very much used in the glassworks for making glass. The following is very good for fireproofing wood, canvas, etc.: Mix together 4 parts of powdered borax, 3 of Epsom salts, and 12 or 15 of warm water. This is excellent for rendering clothes fireproof, and should be applied whilst warm. I have read somewhere that a strong solution of alum answers the purpose, but I have not tried it."

T. B. informs C. T. S. (*à Tiheu le Portal*), page 152, that he can procure the silicate of potash he requires of M. Wilks, *Burnley, England*, in any quantity.

Re-tinning Glue Pot.

CASENHEM writes, in reply to EDWARDUS (page 206):—"First clean out pot with hot water and soda, scour the inside bright with sand and water, then wash in clean water. Now wet the inside surface with a flux of muriatic acid *killed* with zinc (soldering acid), mixed with a pinch or two of powdered sal ammoniac, put into the pot about half a stick of tin, and let the pot with its contents be now placed on a clear fire until the tin melts. Now tie a lump of tow to the end of a bit of stick, and wet it in the acid, and rub the melted tin where required. After the bottom is tinned, the glue-pot may be tilted whilst on the fire so as to get the sides heated to the melting-point of the tin. The spots where the tin will not stick are either not bright or not hot enough; the fault is generally the former."

Economical Electric Supply Association.

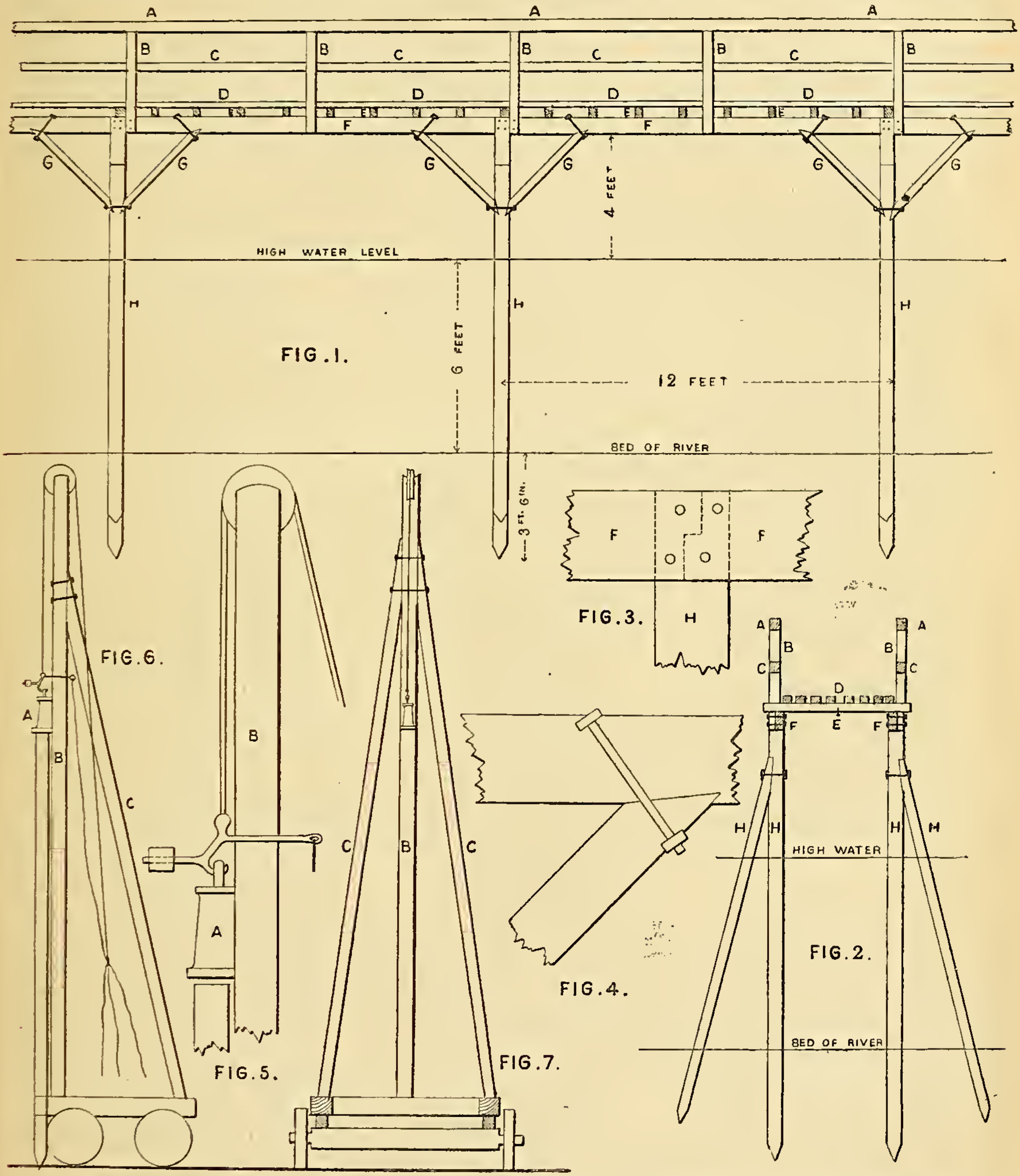
TWIST DRILL writes in reply to A. Y. S., page 310:—"Full instructions are sent with each set of parts, and diagrams of the bell."

Trap for Sparrows.

LOINIS, writing in reply to K. A. T., sends sketches of the trap, formed with four bricks. Every boy knows how to make this, and so does K. A. T. in all probability, so I do not take up space by inserting sketches and answer.

Wooden Foot Bridge.

Loidis writes in reply to J. C. (Ireland).—"I send a design for a wooden foot bridge, which I hope will meet your requirements, and also the drawing of a "Ringing Engine" for driving the piles, to be moved along the bed of the river when the water is low. I give the sizes of the timber which I think will be strong enough. Fig. 1 shows the side elevation of the bridge, and Fig. 2 a section of the same. Fig. 3, on a larger scale, shows the method of connecting the girders and piles. The dimensions are:—Handrail, A, 4 inches by 3 inches; intermediate rail, C, 3 inches by 3 inches posts, B, 4 inches by 3 inches; floor laths, D, 3 inches by 1½ inches, these should be placed ½ inch apart; joists, E, 4 inches by 3 inches, placed 16 inches apart; girder, F, 7 inches by 3 inches; struts, G, 4 inches by 3 inches; piles, H, 5 inches by 5 inches. The



Wooden Foot Bridge.—Fig. 1.—Side Elevation. Fig. 2.—Section. Fig. 3.—Connection of Piles and Girder. Fig. 4.—Connection of Struts and Girders. Ringing Engine.—Fig. 5.—Monkey and its Attachment to Engine. Fig. 6.—Side Elevation. Fig. 7.—Front Elevation. Scale: Figs. 1, 2, 6, 7, $\frac{3}{16}$ in. to 1 foot. Figs. 3 and 4, 1 in. to 1 foot. Fig. 5, ½ in. to 1 foot.

braces or struts must be notched into the beams, posts and piles, and bolted as shown in Fig. 4. The drawings, I think, are clear enough without further explanation. For the ringing engine, the monkey, A, is 13 inches long and 6 inches square at the bottom and weighs about 1 cwt. Fig. 5 shows its construction and working on a larger scale than Figs. 6 and 7, of which the former shows the side view and the latter the front view. The posts, B, are 5 inches square, and the struts, C, 4 inches square."

Ink Stains.

F. A. (*Gainsborough*) writes in reply to F. A. E. (*Newtown Butler*):—"Oxalic acid or salts of lemon dissolved in water will effectually remove all ink stains from linen, etc. Damp the material, apply the solution to the stained places, and wash in ordinary way. Salts of lemon answers best. It is sold by chemists at about 4d. per ounce. Poison."

Removal of Varnish from Brush.

F. A. (*Gainsborough*) writes in reply to AJAL:—"If you will steep your brush in rectified naphtha I think you will be able to clean it. You had better burn the varnish off your pots by placing a little benzoline in them, about a tablespoonful in each, then drop a lighted match in; after it has burnt out you will be able to scrape them out quite easily. Always clean your brushes when you have done using them for the future. It will save you much trouble."

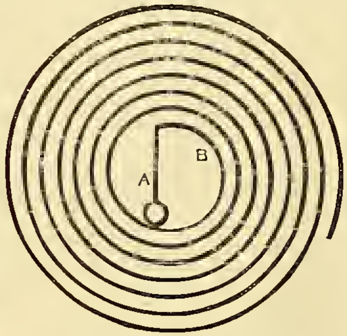
Best Chuck for Model Engine Work.

A. F. S. (*Dresden*) writes in reply to S. M. L. (*Goderich, Canada*):—"You did not go the right way to work to turn your eccentrics. You should have bored them first, and then mount them on a mandrel. The mandrel should then be mounted between centres by means of two carriers with centre holes drilled in their tails, the same distance from centre of mandrel as the throw of eccentric. In the trade the small eccentrics are generally turned from a round brass rod. I do not understand quite what you mean by the hub. If you mean the boss, I can only say that I always cut it off, for there is no use in it, and if chucks are wanting it adds to the trouble in turning. If any of your brass discs have a hole in the centre it is always best to mount them on a mandrel. I fear you will find an independent jaw chuck rather too expensive, unless you make it yourself. The price quoted by Britannia Company for a 6 inch chuck is 80s."—[Apropos of the "hub" which seems to puzzle A. F. S. (*Dresden*), let me say for his benefit that it is a term applied to the central part of anything, especially if cylindrical and projecting, as the nave of a wheel, etc. It is applied also to any protuberance or projecting obstruction, or to a projection of a wheel for the insertion of a pin. It is used more frequently in America than in England. When a man is said to be "up to the hub" it is meant that he is deeply involved or as far gone as possible in embarrassment or difficulty, like a wheel that is sunk up to the nave in mud. I am afraid A. F. S. (*Dresden*) gets "up to the hub" in engineering difficulties sometimes, but this will help him to appreciate the force, beauty and application of the expression.—ED.]

F. W. (*St. Augustine, Florida*) writes in reply to S. M. L. (*Goderich, Canada*) with regard to chucking an eccentric:—"I can only suggest to you to do as I did. Centre the disc and drill a hole just large enough to admit a brass rod, then heat the rod and tin it, let cool, then heat the disc (this to expand the hole) till it is hot enough to melt the tinning on the rod; then mount the disc on the rod square and true, put it in the lathe, turn the edge and the groove for the ring, then turn the side that has no boss on it, and cut off the rod square and true, then bore the hole through the boss for the shaft, mount on a steel arbor and turn the boss and finish that side."

Wire Gong for Clock.

OLLA PODRIDA writes in reply to F. H. R.:—"Wire gongs can be obtained for 6d. each. You can make one yourself, provided you can obtain steel wire of the proper size. For a deep sound, the wire should be about a bare one-sixteenth of an inch in diameter, and coiled seven or eight times or more, as



WIRE GONG FOR CLOCK.

if too deep in sound it can be easily reduced by cutting off pieces from the outer end. To fasten it in the case, the inner end must be bent back at right angles to the plane of coil, and turned into an eye for the reception of a screw. This must be done before coiling. The hammer should strike at A or B, in the annexed sketch."

French Polish Reviver.

CASENHEM sends following in reply to J. W. T. (*Kingston-on-Thames*), page 206:—"Mix together one pint of linseed oil, one wineglass of alcohol. Apply with a linen rag, rub dry with a soft cotton cloth, and finally polish with a silk cloth. Furniture is improved by washing it now and then with soap-suds. Wipe dry, and rub over a little linseed oil upon a flannel."

INFORMATION SOUGHT.

Renovation of Leather.

W. T. B. writes:—"I have a suite of dining-room furniture, covered in green leather, the surface of which has worn brown in places, making the whole look rather shabby. I shall be glad to know if there is any way of renovating the surface of the leather?" [I do not think it is possible to restore the original colour.—ED.]

Violin by Vuilaume.

R. G. writes:—"I wish, through you, to ask Mr. Allen a few questions. I have a violin by Vuilaume, *Paris*. I got it about four years ago for 25s. The tone is very intense and sweet, but, of course, I do not know whether or not it was made under the direction of that great maker. The questions are: (1) Has any one taken up Vuilaume's business, and are there violins made *at present* bearing his label, '*Rue des Petits Champs*, 46?' (2) What would be the probable value of a violin by Perry and Wilkinson, *Dublin*, in a good state of preservation?" [Mr. Allen, I am told, is abroad, looking up old violins in Italy, I believe, for the forthcoming Musical Exhibition, so, as I cannot forward your letter to him at present, I put your queries to readers generally, in the hope that some of them may be able to reply to you.—ED.]

"Highly-Malden" Lantern.

T. N. (*Kilburn*).—Will any one give me the dimensions of the "Highly-Malden" lantern? It was used with very great success at the Polytechnic, and is very much smaller and more convenient than the old-fashioned kind. An illustration of it appears in "Cassell's Technical Educator," but no scale and no particulars are given. It is used with the lime light. I should also be glad to know where to obtain the lenses, and also the price? [If no reader can supply the information you seek, I will endeavour to get it through Professor Pepper. I believe Mr. Samuel Highly—the "Highly" of the Highly-Malden lantern, is not alive. —ED.

Hand Pump for Cellar.

CURIOUS CHIP CUTTER writes again on this subject, and in reference to the reply given to him under this heading in page 310, in which by a printer's error, line 10 should read, "drain; pump," etc., instead of "drain pump;" the word pump and the semicolon having been accidentally transposed. He says—"I *am* acquainted, to some extent, with the principle on which pumps are made, and have an idea of making one. We have so many intelligent contributors to AMATEUR WORK, that I thought I might possibly obtain one or two wrinkles before going any further. The cellar in question is about four feet below the only drain available, and the only way I can account for the water is either a leak from some sewer or percolation. No doubt, the most effective remedy would be a thorough system of drainage, but this would entail great cost, and the owners of the property are deaf on this question; and as we seem likely to have to struggle with it ourselves, I wish to obtain as much information on the subject as I can from my brother subscribers." [I have put it, as you wish, to readers generally, but I do not see, myself, how you are to *lift* the water without making a pump or *lifting apparatus* in the ordinary way with piston, or sucker and valves. —ED.]

Blackening Figures on Glass.

B. S. W. (*Maryland Point*) writes:—"I have a thermometer of 500 Fah., it has, in use, lost the black out of the figures, which are cut in the glass. Can any one tell me how to reblacken them, so as to resist acids, alkalis, and heat?"

Softening and Bending Amber.

J. B. C. (*Wotton-under-Edge*) wishes to know how to soften amber in order to work it into different shapes.

Saws for Buhl Work.

LABOR asks:—Can any reader tell me what are the best sort of saws to use for buhl work, and where to get them, and the best way to make a pair of clamps for holding the veneer?

Repairing Minnow Net.

PUNCH writes:—"I have a large minnow net requiring a new bottom. Could any brother give me the dodge of the round fishing nets? This one is very wide at the top, gradually decreasing to nothing at the bottom. I have cut off the bad bottom, and have now 137 stitches left exposed. The size of the stitches also decreases gradually, but I suppose that is done by simply decreasing the mesh as you go along. If this is not clear, I could forward a piece of the net to anyone who will undertake to enlighten me."

Acid for Etching Brass Plates.

D. S. NETTO (*Aden*) writes:—"I will be obliged to any reader of AMATEUR WORK who will tell me what proportions of acid and water are required to etch brass plate? I had tried to etch a small plate with pure acid (nitric), but overflowed all, and the action was very violent."

Mending Mackintosh.

K. A. T. will be obliged for information how to mend torn mackintosh? [Will BING kindly take this in hand?—ED.]

Cement for Fixing Lamps.

J. B. C. (*Wotton-under-Edge*) wishes for a recipe for fixing lamps in their sockets. He has tried plaster of Paris, but it does not succeed. [I have fixed many perfectly well with plaster of Paris only.—ED.]

Repairs of Sewing Machine.

D. S. NETTO (*Aden*) writes:—"I shall be glad if any one will advise me how to repair a Wilson's sewing-machine; the needle does not lift the thread up, and the small brush close to the reel is worn out, it has got a reel instead of shuttle (boat)."

Colouring Tin Box.

SUSSEX LAD asks:—"Can any reader of AMATEUR WORK, tell me how the colours are put on the tin work that is all spangled, and how to make them, such as the bright red, green, yellow, and the imitation brass colour that I see on penny tobacco boxes?"

Design for Flute.

FLUTE writes:—"Will some one who has got one of the latest patent flutes give a drawing of it with bore, conical or otherwise, the keys, distances of the holes apart, and the size; as I think an amateur might make one for himself." [I am afraid I must differ from you in this.—ED.] "I have seen it in some work, but forget where. The measurements were according to the French system. It is not possible to get one of the new flutes under £8 at the cheapest."

Handles for Table-Knives, etc.

NEPTUNE writes:—"Can any one inform me where I can obtain bone and ivory handles for table-knives and forks? I find the ironmongers charge about 1s. each for re-handling in common bone; whereas they sell a complete knife for about 10d., and this seems to me an imposition." [Any practical man replying to this would do well to put the information in the form of a paper, adding remarks on the cement used for fastening the tangs to the handles, and on the proper method of taking care of knives, for servants frequently spoil them by plunging them blade downwards in a jug of hot, if not boiling water, which loosens the cement. When buying knives, it is better to purchase those whose tangs run through the handle and are riveted at the end.—ED.]

Renovation of Felt Hats.

J. N. H. D. (*New Quay*) writes:—"Will any reader tell me how to clean, re-dye, and re-block old felt hats, also the name and price of any work published on the subject?" [This is not suitable work for an amateur. It would not be worth any one's while to get all the appliances necessary for re-dyeing and re-blocking hats, and if you want to take to hatting as a trade, it is not possible to give the necessary trade teaching in these pages.—ED.]

Painting Dog-Cart.

TRULY RURAL writes:—"Will you insert a request in your columns for information of the best way to paint a dog-cart, and line the wheels and shafts, and then varnish the whole? I wish to paint the body black, the wheels and shafts a light blue, and then line with a deeper shade of blue. If any of your readers can suggest a better colour, having regard to its wearing qualities, I shall feel obliged if they will give their opinion, only the colour must harmonise with blue trimmings. Any information as to paint, brushes, and varnish (more particularly the varnishing, as I expect it will require two or three coats of varnish) will oblige. I have done some varnishing, but it shows a green cast in the light, that does not look well."

Turbine or Water-Motor.

AQUA wishes for information regarding the construction of turbines or any small water-motor on a plan different to that described by CATO. The pressure of water obtainable is about 40 or 50 pounds.

Heliograph.

W. S. M. writes:—"Can any correspondent kindly tell me how to construct a heliograph?"

Etching on Copper.

E. N. C. asks for a short description of the art of etching on copper by means of acids, and where the plates can be bought and at what price?

Re-Fronting Old Shoes.

J. S. wishes to be informed how to put new fronts on an old pair of shoes. [As Mr. Abel Earnshaw has been for some time so busily engaged, apparently, to write or answer queries on Bootmaking, etc., I shall be glad to place any competent writer on this subject on my staff.—ED.]

Enlargement of Bureau.

IONA writes:—"I shall be glad if any of my brother amateurs will give me some idea how to make an addition to my bureau or writing-desk in the shape of a book-case, after the style of the Illustration, Fig. 71, in Part 32 of AMATEUR WORK? It is an old-fashioned one, 3 feet long by 3 feet 6 inches high, and 20 inches wide, contains four drawers, and stands on 4 feet, about six inches high. I enclose an outline of it, from which you will see that the top opens downwards and towards you, forming a writing-table or desk. Now, in the room where it stands it does not look in order, on account of the size of the room, which measures 15 feet by 18 feet. I therefore thought an addition on each side and over the top would give it a better appearance, and that such addition would also be most useful if it could be arranged as a book-case. The colour is mahogany, and I would, of course, stain the new work a similar colour. It must however be plain work, as I have no experience in decorative carpentry, but may be able to add a little ornamentation in fret work, which I am just about commencing." [The drawing you mention has not reached me. Kindly send sketches of front elevation and side elevation, and I will forward them to Mr. Gleeson-White, who, I am sure, will gladly put you in the way of doing what you wish; but it will be necessary to supplement the above information by the sketches mentioned, so that the new work may be brought in accord with the bureau as it now is.—ED.]

ADDRESSES WANTED.

A. W. W. (*Gateshead-on-Tyne*).—If you will send a stamped envelope, addressed to yourself, I will forward you a letter from a correspondent that may be of use to you.

C. J. D.—I have a letter for you in reference to one of your queries in page 359. Please send stamped envelope, duly addressed to yourself.

SALE, PURCHASE, OR EXCHANGE.

Persons availing themselves of this Department of AMATEUR WORK *are requested to note that—*

(1) *No Trade Advertisements can be inserted in this Department, which is open to bonâ fide Amateurs only. The Editor reserves the right of refusing to insert any notice.*

(2) *No charge will be made for the insertion of notices until their number be such as to render it absolutely necessary to do so.*

(3) *Persons writing in reply must forward application under cover to the Editor, in an envelope sealed down, with a Penny Stamp attached in the upper right hand corner, and the* NUMBER *of the notice in the lower left hand corner thus:—*

	STAMP here.
NO. OF NOTICE here.	

(4) *Letters thus marked and enclosed under cover to the Editor will be forwarded immediately to owners of articles for Sale or Exchange, or persons wishing to purchase. No attention will be paid to any communications in which these Rules are not strictly observed.*

(5) *It is desirable that those who reply to notices in this Department should enclose to the advertiser, with their application, a stamped and directed envelope, in order to ensure a reply. When this precaution is not taken, the non-receipt of a reply within reasonable time can only intimate that the article in question is disposed of, or that the proposal made is declined.*

470. Photographic Camera.—A good one wanted, with accessories complete, for tricycle tours. Will exchange for it a pair of Magic Lanterns, by Griffin, 3½ in. condensers, with gas jets and dissolver, or will give cash. (*Jersey.*)

471. Amateur's Printing Press, good, value 25s., and type, for sale, cash 10s., or exchange to value of 15s. Particulars sent. (*Birmingham*.)

472. Birch-bark Canoe, made by North-American Indians. Quite new, has never been used, and is in perfect condition. Length, about 15 ft., and breadth, 2 ft. 6 in., complete, with two paddles. Price £6. Carriage paid to London. (*St. John's, New Brunswick*. Letters in reply to this must be prepaid, 2½d.)

473. Small Turbine or Water Motor wanted. Will give good exchange. Send full particulars as to size, power. (*Manchester*.)

474. Materials, etc., for Current Meter, for measuring current given off by batteries or small dynamos. With sketches, sent for 3s. 6d., or per Parcel Post, 4s. (*Manchester*.)

475. Achromatic Telescope, good as new, cost 7s. 6d., will sell for 5s. 6d., or what offers? (*Leeds*.)

476. Coins and Tokens.—85 Copper and 30 Silver, including several Fourpenny Pieces, Shield Shilling and Sixpences, Lion Shilling, etc. Will take 25s. (*Leeds*.)

477. Pair of Trousers.—Perfectly new, misfit, summer pattern, waist, 30 in., leg (from waist), 42 in. Cost £1 1s. Will exchange for AMATEUR WORK to present date, clean and unbound, or what offers? (*Leeds*.)

478. Revolver, Six Chambered, self-cocking, repeating action, muzzle loading, inlaid stock; small spring wanted, otherwise perfect. Cash, 10s. 6d., or what offers in exchange? (*Leeds*.)

479. Association Football Case, Size 6. Cash, 2s. 6d., or what offers? (*Barnsley*.)

480. Boy's Own Workshop.—Cash, 10d., or what offers? (*Barnsley*.)

481. Every Boy's Book; a Compendium of Boys' Sports, with Rules, etc., and Hints on Fishing, Fencing, Swimming, Boating, Legerdemain, etc. What offers? (*Barnsley*.)

482. Antique Bedroom Lamp.—Cash, 1s., or what offers? (*Barnsley*.)

483. Holly Walking Stick.—Cash 1s., or what offers? (*Barnsley*.)

484. Indiarubber Cement. — In bottle, cash, 6d., or what offers? (*Barnsley*.)

485. Engineer, Vols. VI., VII., VIII., IX., X., bound, perfect, and clean, offered in exchange for Fret Machine (Treadle). (*Islington*.)

486. Practical Works. —(1) AMATEUR WORK, Vols. I. and II., bound, Vol. III., unbound; (2) Every Man His Own Mechanic, bound, all clean and new. What cash offers? (*Newark*.)

487. Half-Plate Camera, bellows bodied, rack adjustment, folding tailboard, fitted with Dallmeyer's 5 by 4 Rapid Rectilinear Lens, printing frames, folding stand, etc. The whole in splendid condition, having scarcely ever been used. Cost about £10; what offers? (*Keith*.)

488. Piano Keyboard for Sale, and the whole of the inside fittings. Keys hardly worn. What offers in cash or exchange? (*Hailsham*.)

489. Organ Case and Materials. — (1) Organ Case, very neat and elaborate, in Spanish mahogany, three towers of small gilt pipes, suitable for a small chamber organ; (2) a Stopped Diapason, CC to G, and a Clarabella (Treble), 25 notes, both in perfect order. Cash, or a Reed Stop in part exchange. (*Guernsey*.)

490. Cricket Bat —Patent Repercussive Cane Handle, new last autumn, never used, cost 15s., will take 10s., or exchange Nos. 1—35, Parts, of AMATEUR WORK, clean and complete. (*London, S.E.*)

491. Batting Gloves. — Tubular India-rubber, quite new, cost 7s. 6d., will take 5s., or exchange. Cassell's Household Guide preferred, or Every Man His Own Mechanic, complete and clean. (*London, S.E.*)

492. Ventriloquial Heads and Magic Lantern. — Four Heads, maker, Lé Uni; also a Magic Lantern. Will exchange for Printing Press, etc., or sell for cash. (*Manchester*.)

493. Carved Oak Bureau, in good condition and recently repaired. What offers? Purchaser to pay carriage. (*Edinburgh*.)

494. Organ for Sale or Exchange. Four Stops, suitable for repairing by amateur. Front black and gold, just renewed. (*Edinburgh*.)

495. Artist's Cabinet in Oak, nearly new, cost £3 10s. What offers? (*Edinburgh*.)

496. Organ Windchest Wanted, suitable for six or eight stops, with soundboard and paper pipes, well and neatly made, as specified in AMATEUR WORK. Name price and particulars. (*Edinburgh*.)

497. Riddell's Carpenter, Joiner, and Hand Railer, fifty-nine plates and card-board models. Will take £1, or exchange for ¼-Plate Camera and Lens. (*Bristol*.)

498. English Mechanic and World of Science.—Vols. XIII. to XVI. inclusive, bound in boards and leather backs, excellent condition. Will exchange for Vols. I., II., III. of AMATEUR WORK, complete, with plates, or what offers? (*London, S.E.*)

499. Quiver.—One Year's Numbers (1883), unbound, clean, and good condition. What offers? (*London, S.E.*)

500. Books for Sale or Exchange.—(1) Hoffmann's Modern Magic; (2) Houdin's Conjuring and Magic; (3) Pepy's Memoirs and Diary; (4) A Voyage in the Sunbeam; (5) Chiromancy or Palmistry; (6) Leopold Shakspere, in monthly parts, etc. (*London, S.E.*)

501. Pump.—Wanted, a Small Hand Pump for forcing carbonic acid gas into wine bottles. (*Stratford-on-Avon*.)

502. Pipe Organ Soundboard Wanted, complete, with six or seven sliders; not less than 5 ft. long; channels 3 in. deep, etc. State price and full particulars. (*Newbury, Berks*.)

503. "Meritoire" Camera, ½-Plate, with lens, two dark slides, and stand complete. Good as new, with polished mahogany box. Price 30s. (*Grangemouth*.)

504. Books, Various. — (1) AMATEUR WORK, unbound, Parts 1—40, except Parts 7, 13, and 19, clean, with Supplements; (2) Boy's Own Paper, 20 Parts, not consecutive; (3) Harmonium Tutors, King Hall's and Robinson's, cost 2s. and 1s. 6d.; (4) Stainer's Organ Tutor, cost 2s. What offers? (*Glasgow*.)

505. Single Lens for ½-Plate, new, cost 7s. 6d. What offers, cash or exchange, no live stock? (*Glasgow*.)

506. Miscellaneous Books.—A number of Standard Novels, AMATEUR WORK, and other Books, etc., etc., in exchange for Fretwork Corner Brackets, or Electrical Model Machinery, etc., etc. (*Burnley*.)

507. Every Man His Own Mechanic — Re issue in Parts, good as new, will exchange for Turning Tools, Joiner's Tools, Fretwork Patterns, Saws, or anything useful to amateur woodworker. (*Middlesbrough*.)

508. Pedometer, quite new, never used, offered in exchange for Stock and Dies, Whitworth's pitch, cut up to ½ in. (*Buxton*.)

509. Amateur Work, Parts 9 to date, inclusive. What offers? (*London, E.C.*)

510. Model Steam Engine, gun metal cylinder, 3 in. by 1 in. inside, beam, force pump, flywheel, well made. Price £3 10s., or what offers? (*Holloway*.)

511. One Manual Pipe Organ. — Nine stops, GG to D, mahogany case, 28 gilded pipes on front, hand and foot blowers. Height about 8 ft. Price £13, or exchange for good American Organ. (*Bromsgrove*.)

512. Bicycle, 52-inch, nearly new, half-plated, rollers, with stop bell, valise, suspension saddle, etc. Price £4. (*Weston-super-Mare*.)

513. Music.—A large quantity, various. £1 worth sent free on receipt of 15 stamps. (*Weston-super-Mare*.)

514. Lathe, old but useful, back-geared, 4-inch centres, wooden bed, very heavy 27-inch flywheel, double throw crank, compound slide-rest, four-jawed chuck, face-plate with driver dog, taperscrew chuck, three cupchucks, T rest and three T's, carrier wrench, etc. £3. (*London, N.W.*)

515. Half-horse Engine, nearly finished, suitable for lathes or steamboat, consists of cylinder, 2¼ in. diameter, 4¼ stroke, bored, and flanges turned and fitted, steam chest on cylinder, with ports out, cover and stuffing-boxes fitted, piston and piston-rod turned and fitted connecting-rod (turned) and eccentric fitted. Guides planed and fitted; also cast-iron bed-plate planed ready for cylinder to be mounted. Price for the lot, 25s., or exchange, good Bicycle, 50 or 52 inch. (*Manchester*.)

516. Concertina, Anglo-German, steel notes and ivory keys, worth 14s., offered in exchange for good Fret Saw Machine. (*Dublin*.)

517. Boy's Own Annual, Vol. II., handsomely bound. What offers? (*Dublin*.)

518. Shocking Coil, with small three cell, constant, powerful battery, in box, with switch for three strengths, complete, with handles. Will sell for 9s. 6d., or good exchange. What offers? (*Lewes*.)

519. Boy's Own Paper.—Vols. III., IV., V., and VI., 3s. 6d. each, carriage paid. (*Belfast*.)

520. American Orguinette, quite new, plays 9 tunes. Cost £3, will take £1 10s., and pay carriage. (*Belfast*.)

521. Accordeon, organ toned, quite new. Cost 10s. 6d., will take 6s., and pay carriage. (*Belfast*.)

522. Books, Various. — (1) Reporter's Magazine, Vols. II., III., bound; and odd numbers; (2) Shorthand Magazine, Vol. XXXV., bound, and XXXIV. and XXXVI. unbound, with indices, quite clean; (3) Ward and Lock's History of the World, 2 vols.; (4) Land, Sea, and Sky, 1 vol.; (5) Scientific Recreations, 1 vol. All bound in half morocco, marbled edges, extra gilt. Never read. Offers in cash. (*London, N.W.*)

523. Tricycle, Victor, 44 inch wheels, ball bearings, and new 10s. 6d. lamp. In capital condition and a bona fide bargain. £6 6s. (*Birmingham*.)

524. Joiner's Iron Door Cramp. Wanted to purchase for cash, cheap. (*Windsor*.)

525. Requisites for Magic Lantern.—1 pair 3 in. Condensers, 1 pair 2 in. Object Glasses, Brass Tubing, 1 Patent Duplex Burner, 1 Sheet of Barnard's Transfers, offered in exchange for ¼-Plate "Le Meretoire." Or what offers, cash or otherwise? (*St. Germans*.)

526. Journal of Decorative Art —Will exchange monthly for any good book on Design, or what offers? (*St. Germans*.)

*** List closed May 6th.

COMMUNICATIONS AWAITING REPLY

A. F. S. (*Dresden*), cuts illustrating your communication not yet sent in by Engraver; G. E.; T. H. (*Shepherd's Bush*); F. C. H. (*Hoddesdon*); TWIST DRILL; TRULY RURAL; LOIDIS; TYPO; STILL MORE; WESTWOOD; J. M.; INCUBATOR; PHONETIST; APPRENTICE; MATHETES; NOVS; C. H. O. (*Cairo*); SAVOIR FAIRE; ENQUIRER; B.E.T. (*Surbiton*); A KENTISH MAN; G. W. (*Amble*); J. W. (*Crewe*); ROA ROY; O. B.; D. D. (*Bala*); BINO; F. W. D. (*Holloway*); VIOLONCELLO; FRENCH POLISH; R. P. (*Westminster*); DIFFICULTY; R. S.; M. W. (*Burnley*); FENMAN; MAGNET; C. H. L.; AMATEUR PIANO MAKER; J. S. G. (*Chesterfield*).

List closed May 6th, 1885.

SIX-INCH WOODEN LATHE.

Designed by

OLLA PODRIDA.

REFERENCES.

FIG. 1.—Front Elevation; FIG. 2.—End Elevation; and FIG. 3.—Plan; all drawn to ⅛th scale, or 1½ inches=1 foot.

FIG. 4.—Sectional Elevation of Headstock, drawn half size.

FIGS. 5, 6, 7, and 8.—Views of Alternate Forms of Headstock, also drawn half size.

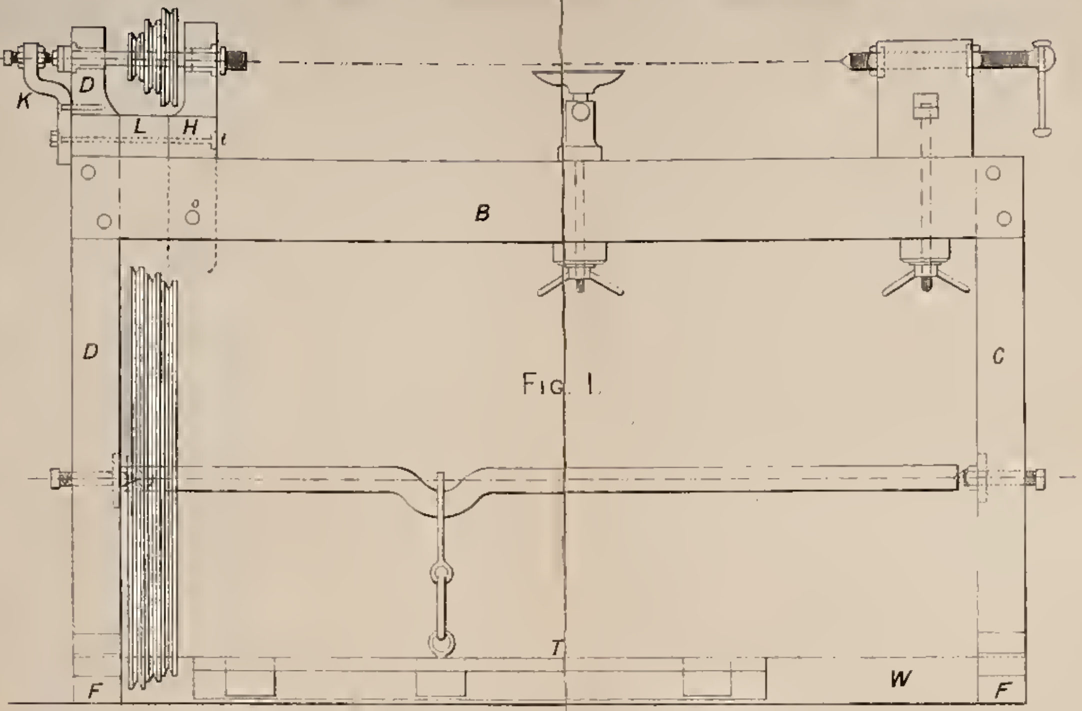


FIG. 1.

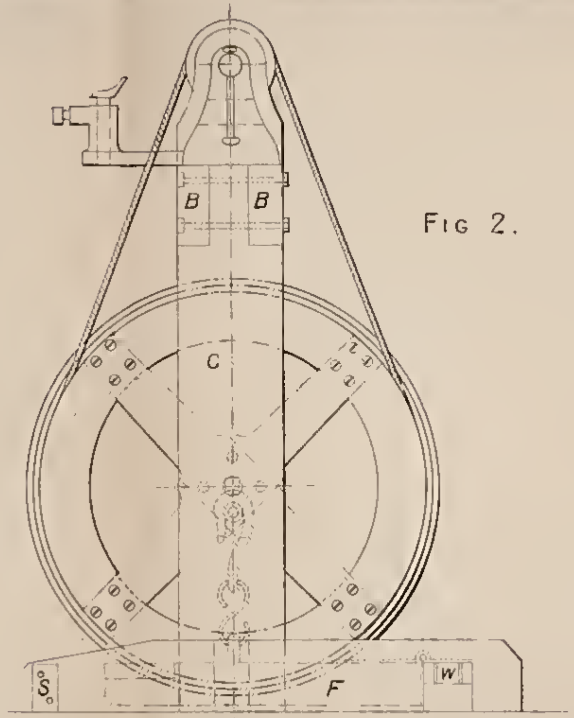


FIG. 2.

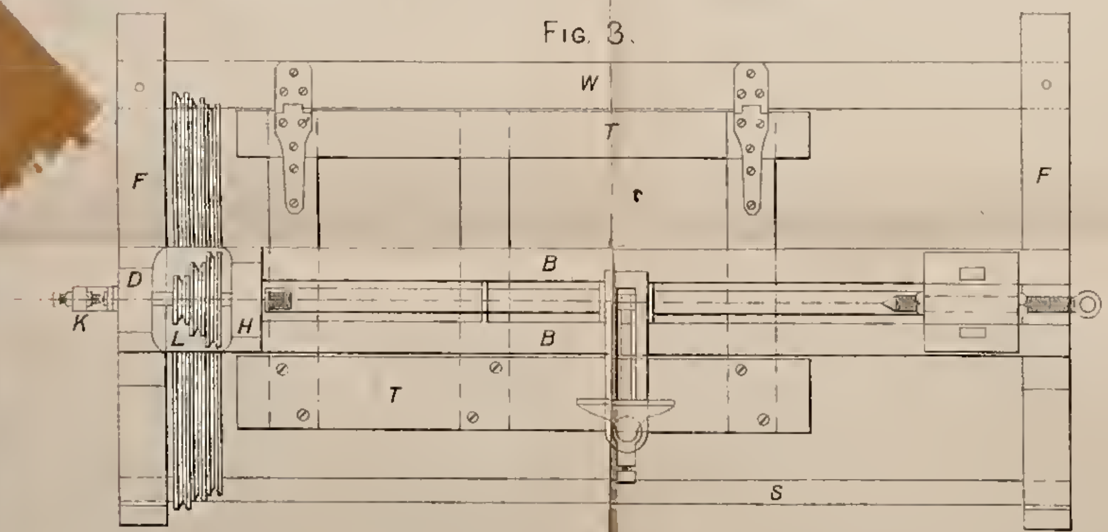


FIG. 3.

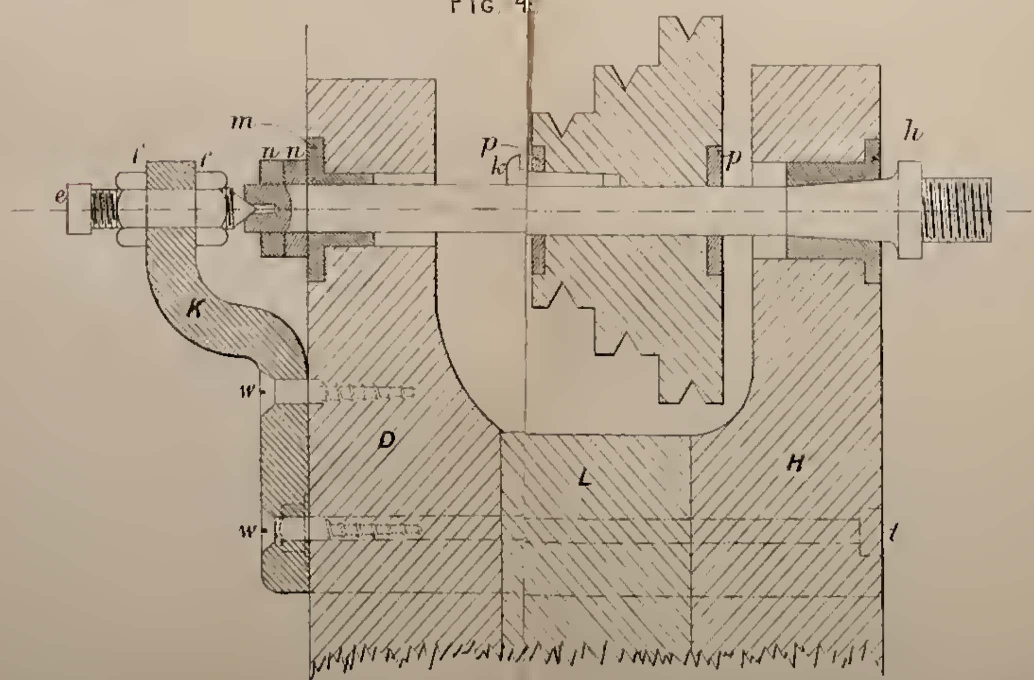


FIG. 4.

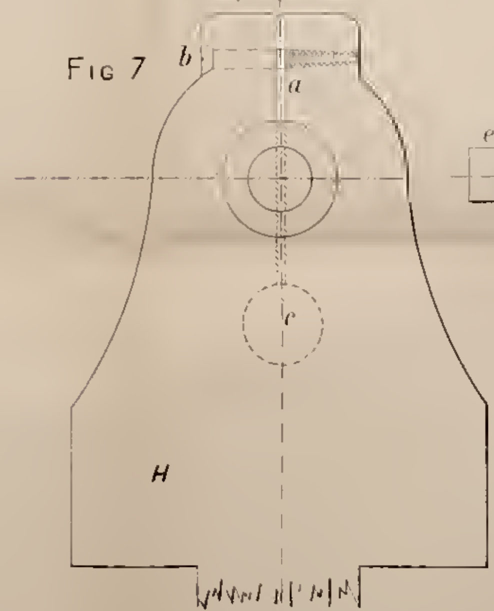


FIG. 7.

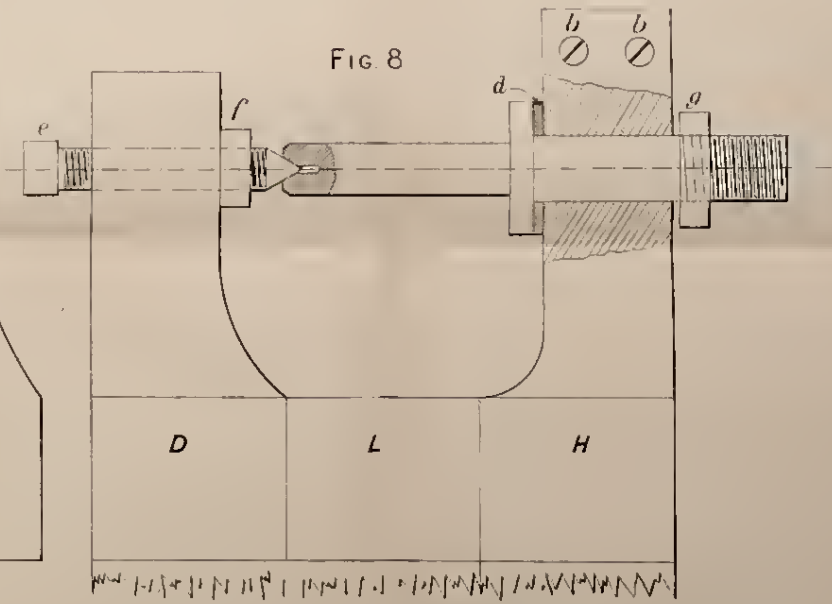


FIG. 8.

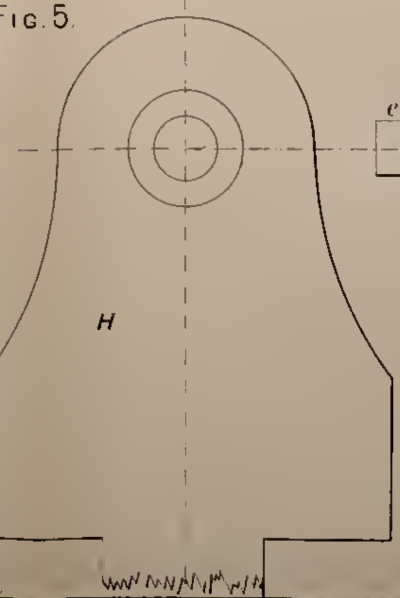


FIG. 5.

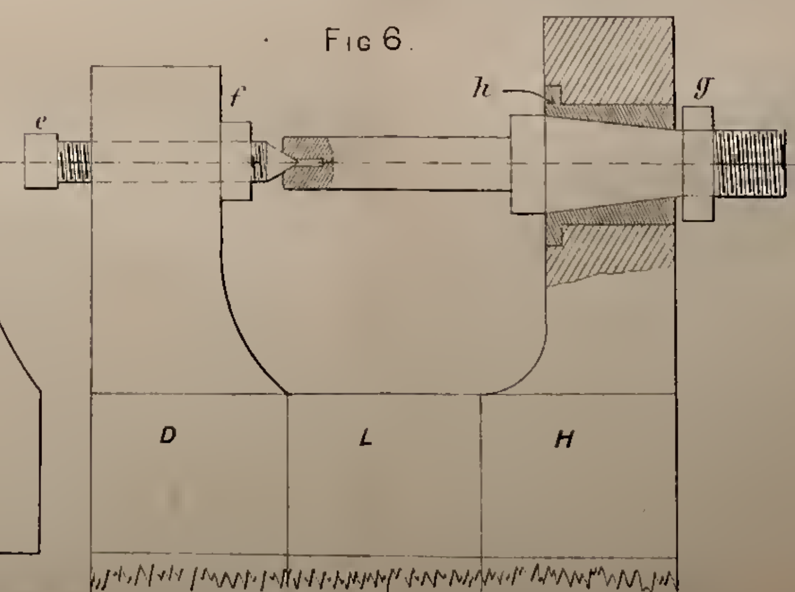


FIG. 6.

REED VOICING FOR AMATEUR ORGAN BUILDERS.

By the Author of "FACTS ABOUT ORGANS."

BEFORE entering upon a brief explanation of the principles of reed voicing, it will be first necessary that I ask my readers individually what it is that they wish to do. Is it to voice a reed stop, say an Oboe (or any other stop), procured *unvoiced* from the hands of a metal pipe maker? If so, I do not say that it is impossible. I feel, moreover, convinced that with practice (and patience especially), they may accomplish it if my directions are carefully followed. Still I would for a moment stand aside from my subject, and, as one who knows the difficulty they would rashly engage in, say, Don't. Your best will be far worse than the worst voiced reed you can buy, and the saving (if any, as you are sure to spoil lots of tongues) will be insignificant.

Returning from this digression I would ask, is it to overhaul an old or secondhand reed, some notes of which are either dumb or do not match the rest in tone? or is it to extend a Tenor C reed to CC in new pipes. If the object is either of these, it is quite feasible, and the extending of a Tenor C to CC reed can be done by amateurs at less than half the cost of the CC stave of pipes from a maker. Assuming that it is desired to make a note speak which is dumb, I will explain the mode of proceeding; but minute attention to every detail will be indispensable.

First of all let us see what tools we shall want, which is naturally a primary consideration. They are: A block of hard wood, planed quite true (see diagram 1), about 10 inches or a foot long, 2 inches square; two stout bradawls (the largest having its blade $\frac{3}{16}$ inch in diameter, the other somewhat slighter), both firmly fixed in strong handles; two small files, one of which must be either well worn or if new be ground nearly smooth, this will hereafter be called the smooth file, neither must have any handle; a piece of fine emery cloth; a stout knife and a $\frac{3}{4}$ inch chisel, these two last being to remove or refix the wedge of the reed.

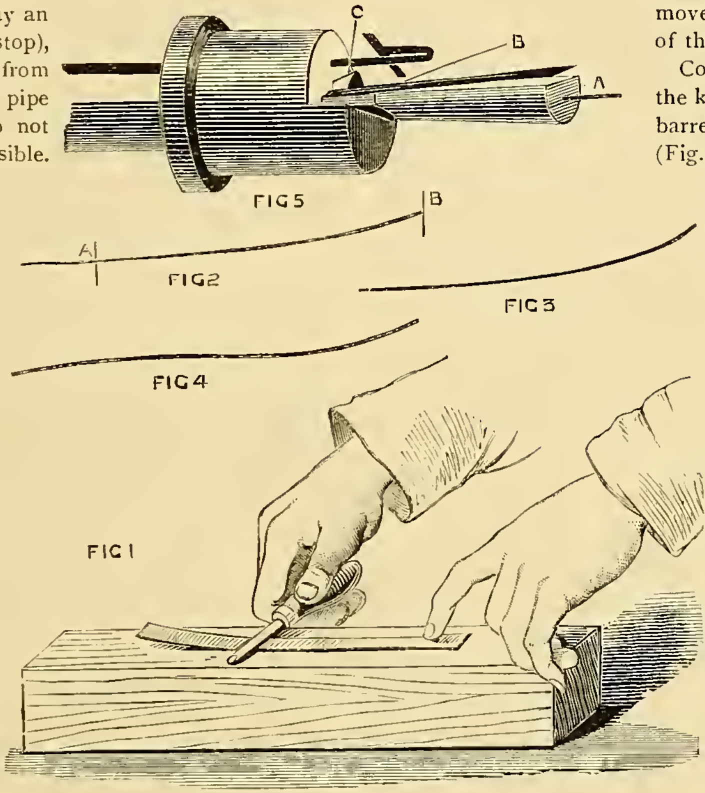


FIG. 1.—METHOD OF CURVING REED IN REED VOICING. FIG. 2.—A GOOD CURVE. FIG. 3.—A BAD CURVE. FIG. 4.—A VERY BAD CURVE. FIG. 5.—DIAGRAM SHOWING MODE OF REMOVING AND RE-FIXING WEDGE OF REED.

Commence by running the knife partly round the barrel A at the point B (Fig. 5), thus marking the amount of protrusion as a guide when fitting it up. Remove the wedge C with the knife, the wire D being previously drawn up out of the way; to do this it must first be pushed down and turned round. The reed and barrel will now fall out. Commence with the barrel, note if it be corroded, or verdigris eaten, or rough; if so, rub this off gently on the emery cloth, this latter being tacked down at its four corners on a board. Treat the reed in the same manner, but be cautious not to bend it in the most infinitesimal degree; refit all, hammering in the wedge with the chisel blade; should this not make the reed speak, the reed curve is not right. The method of curving a reed is shown in Fig. 1; the left hand holds the tail of the reed while a bradawl or circular burnisher is run along it, considerable pressure being exerted. Care must be taken to hold the blade quite flat so as to press on the reed all over, not on one edge only.

Figs. 2, 3, 4 show various results. Fig. 2 is a good curve which should speak a round full toned note; Fig. 3 is a bad one, probably it would not speak at

all; Fig. 4 is still worse, this would rattle like the proverbial "bee in a can." Assuming that the curve is similar to the one shown in Fig. 2, we will suppose the note is tardy in speech. When tuned knock down the wire a little, and note if it becomes prompt when the pitch is thus raised, if so the curve is too great—the tongue must be made a little straighter. To effect this remove the reed as before, and in place of the bradawl or burnisher use the smooth file, held in the same manner. If the curve be very much greater than it should be, or if the reed be hard, it can be *turned over* and worked back with the bradawl, but this in inexperienced hands is apt to produce the form of Fig. 4, I do not therefore advise it. If, however, the form of Fig. 4 results, throw away the reed, as it is almost impossible to get it back truly. Having thus reduced the curve try the note, should it not be right it will either be tardy, in which case it must be yet more straightened, or it will rattle and sound thin; if the latter it is *too straight*, and must be recurved with the bradawl as at first, but not so much. It is only by alternating these processes that the amateur can hope to get the proper tone. If there are several notes to be done in the same stop try to make the curve the same pitch in all. This, which comes by habit to the professional reed voicer, is very hard to get in a first or occasional attempt, and unless it be secured the notes will not match in tone, though they may all be good in themselves.

Now for a few hints on special cases where the note won't come, though all I have shown would seem to have been followed. The causes may be (1) the barrel not being firm in the block, if so wedge up the lead to it, driving in the point of the stout awl about $\frac{1}{8}$ inch from the barrel; (2) the barrel not being set square and the wire pressing only on one edge of the reed; or (3) the wedge not fitting. Too much care cannot be taken that the wedge holds well, it must not be too steep, but *should* hold right to its point; if not, file away the part blackened by contact with the lead till all of it blackens, then it may be said to fit, but not till then. Should the note persevere in rattling or give a hoarse sound, though everything has been tried, doubtless the reed is *buckled* (twisted), or has a *kink* in it (a sharp angle) or crease, like a sheet of writing paper opened always shows original fold; in this case it may be thrown away. New reeds can be cut with a stout knife out of thin brass hammer hardened on a perfectly flat pebble (this is hard to manage); but it is better to buy the reeds finished from a reed voicer. There is much difficulty in getting them, except at exorbitant prices. Madame Veuve Caille, of 86, *Rue de la Fedération, Paris,* supplies reeds cheap and of good quality. I have rarely spoiled any of these reeds in voicing, and find them stand admirably.

Open reeds are easier to manage than closed ones. The Clarinet or Cremona stop is perhaps the most troublesome to voice for an amateur. Orchestral Oboe pipes, and, indeed, the pipes in Oboes of many builders have a little slot cut just under the bell—by opening it the pipe is loudened, and *vice versa.* In putting a new reed to a single pipe, *gauge* the new one to the exact thickness of the one removed, or the tone will not match the other pipes. Circular gauges may be purchased through any reed pipe maker.

Lastly, if it be desired to extend a Tenor C reed to CC, the boots, tongues, blocks, etc., complete, will cost under £3, and the bodies may be made of wood, zinc, and, perhaps, of stout paper. The voicing of large reeds is very easy compared to that of small ones, and only by gross unskilfulness can a tongue be spoiled.

HOW TO MAKE A TREADLE TOOL-GRINDING AND SETTING MACHINE.

By the Rev. ALGERNON THOROLD, M.A.

II.—THE FRAME OF THE MACHINE, AND THE PARTS OF WHICH IT IS COMPOSED.

HERE is a diagram of the grinding machine which so pleased my friend, and which it will be seen at once, is a strong wood frame fitted with a treadle, heavy grooved iron flywheel, and a series of wheels, grit stone, emery wheel for grinding, and a buff wheel for setting and finishing, and so put together as to allow of being taken to pieces with perfect ease, and of being packed in a comparatively small space.

The whole framework, and also the treadle, is of sound and seasoned beach. A B and C D are two stout uprights standing on long cross feet, E F G H. A B and C D, are cut of equal lengths, 3 feet 6 inches, the full height of the machine, and allow for a $3\frac{1}{2}$ inch tenon, running through the feet E F and G H; and after planing up are 5 inches wide and 3 inches thick (see Figs. 5 and 6). E F and G H, the feet, Figs. 4 and 5, must be cut 2 feet $2\frac{1}{2}$ inches in length, and after being worked up, are $3\frac{1}{2}$ inches deep by 3 inches thick, mortised in the centre 1 inch by 5 inches, to carry the tenons of the uprights, Fig. 6, tightly; when home, the uprights should be pegged to the feet, the pegs passing through the tenons. The front ends of the feet also, should be bevelled as in the diagram, Fig. 5, to give a lighter appearance. The back ends must, however, be cut down square as shown in the dotted lines of Fig. 7, to carry the cross beam upon which the treadle is hung, and also to give greater rigidity to the stand. The full breadth of the machine is 3 feet.

Having cut out and prepared both the uprights and the feet, we may proceed to tie them together

with the stout cross beam, K L, Fig. 8. Rip out and prepare in beech a beam, 3 feet long by 5 inches wide, and 3 inches thick, allowing something above these measurements for working up. Mark off $3\frac{1}{2}$ inches from each end with a pencil, and measure out carefully a double tenon at each end, as shown in Fig. 9. Both ends of the crossbar being tenoned as directed, to the measurements given in Figs. 8 and 9; cut corresponding mortises in the uprights, as in Fig. 10. It is important that accuracy should be observed in cutting both mortises and tenons, or much of the necessary stability of the machine will be lost.

Fig. 10, it will be seen, is a side view of one of the uprights as it stands on its foot, and shows that the mortises are to be cut to carry the tenons parallel in their length, and a comparison of the measurements will further show that the breadth of the uprights and the breadth of the crossbar are equal, viz., 5 inches. The crossbar being ready, we may fasten it into place.

In the uprights at D in Fig. 10, bore a passage through, and into the cross beam K L, sufficiently small to allow a square headed $\frac{1}{2}$ inch iron bolt 8 in. in length, tapped with a coarse thread for 2 inches at the end, to be screwed tightly in, but with sufficient freedom to allow of easy removal. The opening of the passage in the uprights should not be countersunk, but the bolt head must screw up tight to the face of the wood, or, better still, to an iron washer. A cross section of one upright and cross beam, with passage and bolt, is shown in Fig. 11.

These bolts, when screwed home, will keep the frame perfectly firm; but before being screwed in for a permanency, they should be thoroughly covered with a mixture of tallow or mutton fat mixed with blacklead. No difficulty will then be experienced in removing them when necessary. The heads of the uprights should be left square, and will be found useful to place tools upon when the machine is in use.

We may now look at the treadle arrangement, T, Fig. 12, a three-sided frame, 1 foot 6 inches wide and 14 inches from back to front, formed of stuff $1\frac{3}{4}$ inch by 1 inch thick when worked up. This is most strongly put together by cutting the ends of the strips used into half joints, and screwing them together as in Fig. 13.

Beneath the frame is an iron bar, Fig. 14, to carry the connecting rod between the treadle and the crank on the axle of the driving wheel. This bar should be $\frac{1}{2}$ inch diameter, 1 foot 3 inches in length, and the ends flattened and drilled for screws; its position under the treadle is given by measurement in Fig. 12.

To put the treadle in position prepare D, a strip of beech 3 feet long, $1\frac{3}{4}$ inch wide and 1 inch thick; screw it across the back of the frame into the notches already made in the back of the feet, as in Fig. 15.

It will now be found that the foot projects beyond the strip D, and the projecting part may be bevelled as in Fig. 16. Now screw a pair of strong iron butts upon the extremities E E, of the treadle in Fig, 11; bring the ends E, E, to within $\frac{1}{2}$ inch of the bar D, and screw the other sides of the hinges upon it, as in Fig. 11.

Going up a little higher we come to the flywheel and crank, Fig. 17. D, the flywheel, may vary in diameter, but must not exceed 2 feet 6 inches. It should be of iron, or iron and woed; the best size for the particular purpose being 2 feet 2 inches; such wheels may often be picked up at old iron yards, or in secondhand tool shops, and being originally made for lathes, are generally grooved for several speeds, besides sometimes carrying a sunk iron road in the flat of the circumference for a leather band. Such a wheel should be sought for in preference, being useful for connecting the machine with a saw bench or fretwork machine. B B is the bar which carries the flywheel, and should be $\frac{3}{4}$ inch square bar, steel hardened at the ends, and also conically drilled in at each end to work on bolts screwed through the uprights. Fig. 18 shows section of one end of axle drilled in conically, to carry the point of the bolt on which it runs.

Some of the readers of AMATEUR WORK may probably be sufficiently skilled in smith's work to prepare the bar for themselves, but should they not care for the work, any neighbouring blacksmith will, under their directions, get out what they need.

When finished, the crank bar must measure 2 feet 3 inches long, but to avoid any error which cannot afterwards be easily remedied, it is advisable to cut the required material somewhat longer in the rough, leaving the steel hardening and drilling till last, as in turning the crank, which must have a throw of 2 inches (see Fig. 17), a little more may accidentally be taken up than was intended. Should it be too long when the crank is finished, the extra length can be easily cut off.

The crank bar being ready, the next important step is to fasten on the flywheel. This is accomplished by inserting well prepared wedges, a little thinner only at one end than the other, between the bar and the wheel, and driving them firmly in, one on each of the square sides of the bar.

The nearer the wheel is brought to one end of the axle the better, as it is thus well out of the way when standing before the machine; but not to leave any uncertainty in the matter, it may be fixed so that 1 inch of the axle shall project beyond the nave of the wheel. The wedges should be inserted so that there shall be only two thick ends on each side of the wheel, the thinner ends of two wedges coming between the two thicker ends on the same side; this will keep the wheel straight on its seat.

When the framework of the machine is bolted together, and the side bolts to be described imme-

diately, inserted, and upon which the axle is to run, it will be a considerable help in getting the work true, if the wheel and axle are tried in position. We must not take for granted that the wheel has been properly centred on the axle, but insure this by carefully guarding that the wedges are of similar substance.

Suppose, for instance, that the axle is 1 inch square, and the passage through the nave of the wheel and through which the axle goes, is $1\frac{1}{2}$ inch square, we obtain the true substance of the wedges by subtracting 1 inch, the thickness of the axle, from $1\frac{1}{2}$ inch the width of the passage through the wheel, and dividing the difference, which gives $\frac{1}{4}$ inch as the thickness of the wedges. These, however, must go in tightly, hence, should be a full $\frac{1}{4}$ inch thick. It has already been said that they should be slightly reduced at one end to allow an easy entrance to be effected. After being centred, however, it is more than likely that when the axle and wheel are hung in the frame, we shall find that the wheel wobbles a good deal; to correct this, take a hammer and tap the wheel on its circumference, on the side which is apparently out of bearing, till it sits true on the axle. This should be done before the wedges are fully home.

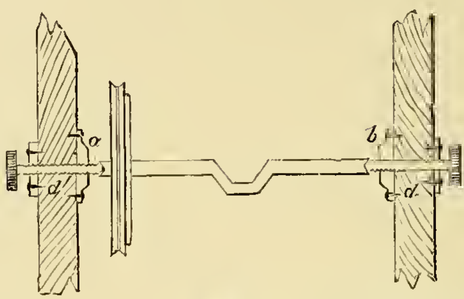


FIG. 23.—SECTION SHOWING AXLE HUNG ON ONE BOLT AND READY TO BE SCREWED UP WITH THE OTHER.

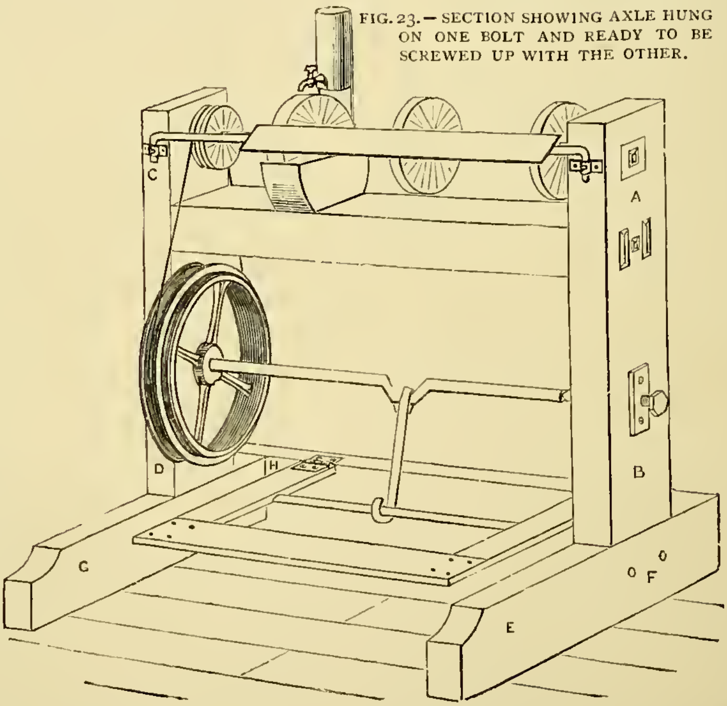


FIG. 4.—VIEW OF TREADLE GRINDING MACHINE COMPLETE.

It being desirable, as stated, to try the crank, axle and wheel in position, it will be useful to describe the method of hanging it on the frame before proceeding to the grinding wheels.

Prepare two strong $\frac{1}{2}$ inch bolts, tapped with a coarse thread up to the head, similar to those used for screwing up the frame, $6\frac{1}{2}$ inches long (see Fig. 19). Bore through the centre of each upright, at a point measured 1 foot $2\frac{1}{4}$ inches from the lower face of the foot, or from the floor, when the foot and upright are standing in position, a passage sufficiently large to allow the bolts to be drawn through backwards and forwards easily, without screwing.

Next prepare two $\frac{3}{16}$ iron plates, 3 inches long, $1\frac{3}{4}$ inch wide, corners and sides neatly squared up, and through each of them in the centre drill a passage, which, when tapped, will correspond with the thread on the bolt, and allow it to be screwed through without wobbling; drill also in the corners, and countersink four screw holes, see Fig. 20. Then screw these plates on the *outside* faces of the uprights, so that the passages in the iron plates and uprights correspond.

Now prepare two more $\frac{1}{2}$ inch iron plates, 4 in. long by $1\frac{1}{2}$ inch wide, and shape them as in Fig. 21. Through the centre of each drill a passage, similar to that in the plate shown in Fig. 20, and tap it with a similar thread, to allow the bolt to pass firmly through; also drill and countersink two holes for screws, as at A, A, Fig. 21. Then screw those plates upon the *inside* faces of the uprights, so that all the large passages may correspond. The bolts, Fig. 19, may then be screwed through the plates and uprights, and will form two pivots on which the axle will run without any friction.

Fig. 22 shows a section of the upright and axle, with the bolt and plates in position. To hang the axle, we proceed to put the bolts into position as described, screwing them so far through as just to allow the axle to pass between them. This done, lift one end of the axle upon the pivot on whichever side

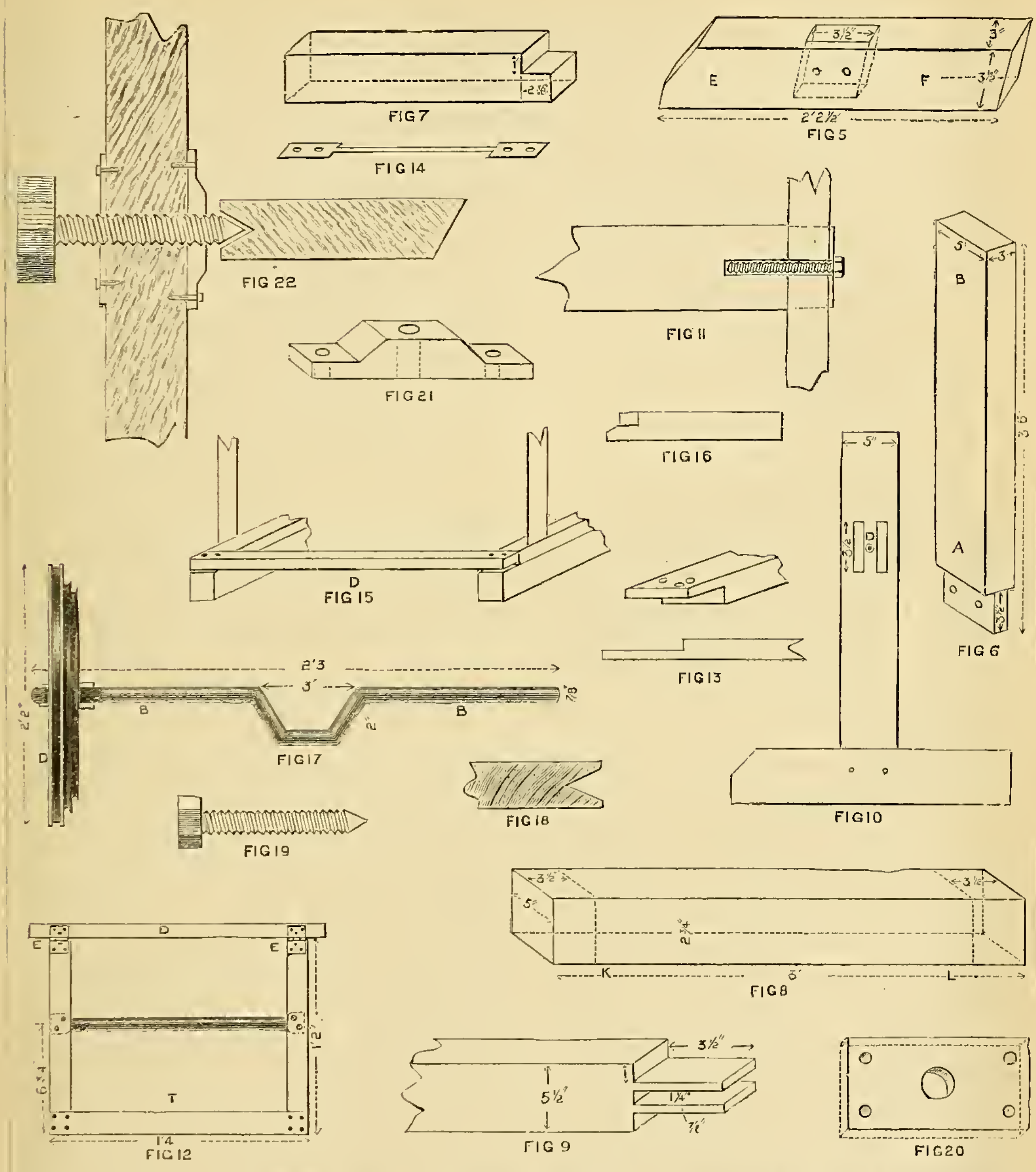


FIG. 5.—THE FOOT. FIG. 6.—UPRIGHT. FIG. 7.—FOOT SHOWING BACK END CUT DOWN SQUARE TO CARRY BAR FOR TREADLE. FIG. 8.—CROSS BEAM. FIG. 9.—END OF CROSS BAR, SHOWING DOUBLE TENON. FIG. 10.—SIDE VIEW OF UPRIGHT FIXED TO FOOT. FIG. 11.—CROSS SECTION OF UPRIGHT AND CROSS BEAM WITH PASSAGE AND BOLT. FIG. 12.—TREADLE ARRANGEMENT. FIG. 13.—JOINTING OF PARTS OF TREADLE FRAME. FIG. 14.—IRON BAR TO CARRY CONNECTING ROD BETWEEN TREADLE AND CRANK. FIG. 15.—STRIP ACROSS FEET TO WHICH TREADLE IS HINGED. FIG. 16.—BEVELLING OF END OF FOOT PROJECTING BEYOND FOOT. FIG. 17.—FLYWHEEL AND CRANK. FIG. 18.—SECTION OF ONE END OF AXLE DRILLED IN CONICALLY TO CARRY POINT OF BOLT ON WHICH AXLE RUNS. FIG. 19.—HALF INCH BOLT FOR HANGING CRANK AXLE AND WHEEL. FIG. 20.—IRON PLATE TAPPED WITH THREAD TO TAKE BOLT. FIG. 21.—BOLT PLATE FOR INSIDE FACE OF UPRIGHT. FIG. 22.—SECTION OF UPRIGHT AND AXLE WITH BOLT AND PLATES IN POSITION.

is most convenient, and press the axles sideways, so that the cone drilled in the axle may slide over and rest upon the point of the bolt; then lift the other end of the axle and screw up the second bolt into its corresponding cone.

Fig. 23 shows section with the axle hung on the pivot at *a*, and ready to be screwed up at *b*. It will now be found that the axle and wheel will run freely and with very little friction, between the pivots formed by the bolts *d*, *d*. When in work it will be found better to lubricate these pivots with tallow than with oil; and they should not be screwed up tighter than actually necessary to keep the axle in place.

(*To be continued.*)

TYPE-FOUNDING AT HOME.

By J. R.

II.—CONSTRUCTING THE FUNNEL, MAKING THE MATRIX, AND FINISHING THE TYPE.

SOME plan must now be adopted for filling the mould with melted metal. I believe practical type founders give their mould a sudden jerk upward when they pour in the metal, but this dexterous movement can only be acquired by practice, and will not succeed with amateurs, who, instead of driving the liquid metal into the mould, will throw it out, and very likely injure themselves.

The theory is this. The mould being full of air, the melted metal is not able of its own specific gravity to force out all this air, and the result is that the cast will be round-cornered and indistinct, especially in the case of small or thin letters, hence the necessity of adding weight by some means to enable the metal to drive out the air and fill all the interstices of the mould. I think this can be done by having a funnel that will contain a good weight of metal; mine will hold two ounces, but I never need to fill it, about one ounce will generally do to insure a sharp impression. I have had no experience with very small type; the size which I have made is what is called long primer, a fair-sized book type, and there are some of the characters very thin, such as the comma point, but I find no difficulty in getting them quite sharp with this funnel. But I failed at first by using a small one: no amount of coaxing would induce the metal to go into the hair lines of the matrix till I increased the size of the funnel, which meant more weight of melted metal, and then all went well.

My funnel is formed of a lot of strange pickings, but I shall describe it as it is, and if the principle be understood the material can be altered. I got a piece of a cross-cut saw blade, pretty thick, the shape is not particular; it will require to be $1\frac{1}{2}$ inch broad at one end, it may taper almost to a point at the other, and about $3\frac{1}{2}$ inches long. I riveted on the knob of a window ledge fastener, which served as a handle. Fig. 14 will show this piece. Drill the hole N the same size as N, Fig. 1; lay it on and put a pin through the holes, but do not rivet it yet. The plate will now turn round on the pin over the top of the mould. Set it square across the mould, and having opened the slide to the width of an "em," mark where it covers the opening in the mould, run a drill through this mark, then with a small square file cut it out square as shown at A, making it rather larger than the em opening of the mould. Slant the file so as to make the hole wider on the upper side and form an obtuse edge on the under side all round, and when filing it out see to keep it directly over the opening of the mould, for it is through this hole that the metal passes to fill the mould, and no obstacle should be allowed to hinder it entering full force. This plate acts as a cutter to cut the type the proper height, which will be described after. Meantime we will construct the funnel. It must be made to open in order to get out the block of superfluous metal that is cut from the type. I got two old drawer locks with brass backs. Having removed all the iron work from them and cleaned off the wards, I managed to cut them up to $1\frac{1}{2}$ inch broad and 2 inches high. These two pieces form the back and front of the funnel, the front C, Fig. 16, is only $1\frac{1}{4}$ inch broad; the ledge which formed the top of the lock is now turned down and forms the base, and what was the outside or back of the lock now becomes the inside of the funnel. We then get two pieces of brass (iron will do, but it is not so easy to work), 2 inches long and $\frac{1}{2}$ inch broad at the top, tapering down wedge-shaped to $\frac{3}{16}$ inch at the bottom. These pieces form the end of the funnel, one of them is shown at D, Fig. 15, and the other at D, Fig. 16; they must be dressed to the same shape and size. Then take the back F, Fig. 15, and lay its inside corner over some sharp edge (I do not mean a cutting edge), and with a hammer bend the ledge to a more acute angle, *i.e.*, when standing on its ledge the plate will incline backwards; bend it till D will stand upright when placed as in Fig. 15. Now see that the face is level and that D D will fit closely from top to bottom, then drill four holes through D and lay it on F as shown; hold it here, and putting the drill through one of the holes run it through F, but be sure you leave plenty of length at the bottom, it is rather deceiving owing to the slant. Countersink a little on D and rivet it on, then drill through the other three holes and rivet them the same. Give it a strip with the file to take off any roughness caused by the riveting. Next level the bottom and make it lie flat on Fig 14, especially round the hole

A, for if a crevice is left here the melted metal will go in and be difficult to remove from the funnel. This being done, set it on the cutter-plate as at Fig. 15, and drill the three holes shown at G, Fig. 14. Countersink all holes on the side of Fig. 14, for after being riveted they must have a good head and allow to be filed off level with the plate. Having the holes G drilled through Fig. 14, run them through the ledge, so that the plate and D will just clear the pouring hole A; rivet it on, and it will appear as at Fig. 15, then run through the hole N for the joint pin. Now take C, Fig. 16, bend its ledge so that it will fit with D, Fig. 15, and also stand flat on the cutter-plate, then rivet the other piece D on to it, also rivet a strip of something on to the upper side of the ledge to strengthen it a little, and also to serve as the handle H for opening it. I think Fig. 16 will make this part understood. Now put it on as shown at Fig. 17, and see if D D will form pretty close joints; if not, relieve with the file till it will do so; of course, the bottom must lie flat on the cutter-plate. This being done, we must consider where to put in the rivet I for it to turn on. I cannot give very definite directions for this rivet, but with some consideration the place for it will be found. The idea is to form a hinge on I to allow Fig. 16 to open by turning the handle H, and instead of being what is called hinge-bound, it will describe a clap-to movement. I placed the rivet pretty close to the upright part of C and a little to the left of its edge, but before drilling try to open it on a supposed centre, and you will see where it acts best. Having fixed on the place, run the drill through and countersink well on the cutter-plate E. Rivet up a good head in the countersink, put on the front C and a washer above it, and rivet, but not so tight as to prevent it from turning; and I may here add that the broader the ledge is at this place the better, giving it a more firm base. It will now appear like Fig. 17, and is ready for fixing in the mould. It must have a pin here fully $\frac{1}{8}$ inch thick to turn on, and the holes N, Fig. 1, and N, Fig. 14, must be made to take that size. Having fitted the pin to the mould and funnel, we put a washer above and one below, and rivet both ends so that the cutter-plate will just have room to move round over the mouth of the mould, then turn the cutter-plate round till the pouring hole A is exactly over the mouth of the mould and put on a stop as shown at X, Fig. 18. Put on a slip to project over the stop, for the double purpose of keeping the cutter-plate down, and also keeping the plate close to the stop by its pressure.

The mould and funnel are now complete, Fig. 18, with the exception of a small piece of wood not shown in the figure. It is placed with one end resting against F on the cutter-plate and the other end pushing down against X on the C plate of the funnel, making a sort of barricade to keep the funnel close. To this piece of wood we fix a pin or nail with its point bent like a hook; this serves to pluck out the block of metal from the funnel after it is cut off.

We now make the matrix. Take Fig. 12, and get two pegs of wood, point them so that they go into the tapped holes X, Fig. 12, screw the points through $\frac{1}{4}$ inch, and one of the pegs may rise 1 inch above the block to serve as a handle for lifting it. Then get a piece of deal and make two holes with a bradawl to let the peg points go in, then take a piece of writing paper and lay it on the deal, force the two pegs through the paper into the holes; this will give a nice smooth surface to the matrix blocks. We now get some soft lead melted; tea lead will do, but do not use lead that has been often melted, as it gets hard and might damage the type. I may here mention that my pouring ladle is an old teaspoon of the class sometimes sold for good, but after a week's wear turn out to be only "water'd brass." I hammered it up a little and formed a spout on one side, and having tied its stalk to a piece of wood with small wire for a handle it was ready, and is just the thing.

Having the matrix box S placed on the paper and the lead melted in a ladle, we take up as much as will fill the square box, pushing the scum back with the back of the spoon, and catching the clear metal we pour it into the box. Be sure you have it full; though the lead rise a little above the box, no matter. When the lead becomes solid take hold of the peg and lift the box from the paper, and turning it over the lead will drop out. The paper will not be burned if the lead is not too hot, and we may put it back into the same holes several times, always shifting to a new spot when the paper burns through. Having cast as many as we want we examine the blocks one by one, and if we find a defect in any of them throw that one back into the melting pot. Now take one and put it back into the box S, the notch X giving register, then with a knife scrape over the face just as much as make the surface clear; next try it on to the flap R, see that the lead bears on its centre, if it strikes on one side pare the lead away till it will bear fair, then screw the box on to the flap R, as at Fig. 9 (of course, the wide side of the box to the flap), and see that the lead be resting firm on the flap.

Presuming that we have procured a set of letters or characters, we take a letter, and opening the mould a little we push back the slide F and put the letter in as shown at Fig. 9, always putting the notched side of the type to the side of the mould marked J, and having the cutter-plate turned away from the stop so that the foot of the type may rest on the plate. Now grasp the frame at B, and with one of the fingers on the lever P force the shank block H close to the

type; you might tie a piece of cord round it at B with a turn over the lever, that will relieve both your hands. Now support the cutter-plate below on a piece of wood and turn down the flap R between the guide pins O O, and give R a few taps with a hammer to drive the lead down on the letter. Do not be afraid of this process. If the lead be soft, the letter will make the impression without injuring itself; at least, after doing over a hundred different characters I never spoiled one, and if the flap is gripped down with the thumb at the time of striking down I don't think there is any danger. Be sure you beat the lead well down; I have sometimes failed through inattention to this. The shank will be all right and the letter all right, but between the two there would be a rim like the head of a clout nail, caused by the lead block either being too thin or not being properly pressed down. Then lift the flap, but before removing the letter push forward the gauge W till it rests hard on the slide block. We now loose the cord, open the mould, and take out the letter. Close it again, giving the lever a grip, as the slide will always open a little when the mould is opened from a letter; next turn down the matrix flap and fasten it. I forgot to say that I put on a bulking alongside of the flap the same height, and put on a small thumb sneak like those on a cupboard door, that turned over the flap when down, but could be turned off to allow the flap to rise. Then turn round the cutter-plate into its catch close to the stop, and barricade the front of the funnel with the piece of wood described above.

We are now ready to cast. We must have a melting pot of some kind; mine is a small old goblet, with a handle at the side. I sent to a manufacturing chemist, who posted a few pounds of antimony to me. To every pound of antimony I added three pounds of lead, and melted all in the goblet. I took an old iron tablespoon, and after making it red hot I hammered it up and formed a spout on its side, and fixed a piece of wood to it for a handle. Scum off the dross, having first thrown in a bit of candle or grease to make the dross rise, and be sure to have the metal clean, for if any dross is allowed to accumulate, good-bye to clean casts. Now take a spoonful of the melted metal, and grasping the mould at B pour it without hesitation into the funnel. In a few seconds it will be solid. Return the spoon to the pot, which will be on the fire, then lay your hand on the knob F and give it a sudden push away from the stop, pressing it down at the same time as if you wished to pare the surface of the mould, then lift out the piece of wood barricading the front C and open it. With the iron hook attached to the wood pluck out the block of metal in the funnel, then shut the funnel and put in the barricade again, turn the mould over, turn off the sneak, lift the flap and open the mould, when you will be rewarded by a type dropping out. Next close the mould, fasten down the flap, give the lever a grip to force the slide back to the gauge, and take another cast, the time the metal is becoming solid lay the block you cut from your last letter into the melting pot, and it will be ready to form part of the next cast. I made a tongs from a piece of iron hoop bent like a sugar tongs, which lay in the floor always ready to lift the block. In this manner you go on casting with no trouble three letters in two minutes. If it is a very thin character you will very likely lose the first cast. If the mould is cold, the metal becomes solid before it reaches the bottom. In this case I generally push back the slide from the gauge the width of an em and take a cast of that. Of course, the character is of no use, but it warms the mould. I then press the lever, and the slide goes up to the gauge, and the next cast will be all right.

And now a few words on finishing our type. They have not yet the notches to show which is the bottom of the letter. When a line of type is set up the notches are all on the outside or bottom of the line; if it were not for the notches, it would be very easy to mistake an n for a u, or a d for a p, and the face of every letter would have to be looked at before it was set to know which side to put uppermost. My plan was this: I got a piece of flagstone, level on the face. Taking the letters one by one I gave them a slight rub on it to smooth them; I then set them up in a composing stick which I made of wood, taking care that the bottom of each letter is to the outside. We then transfer them to Fig. 19. It is a block of wood, A, which may be a foot long, having a fine level face and planed to type height; a small block of wood is placed on one end, marked C, the height of the shank of the letter, and a slip B the same height for the face of the letter to rest on, the type being laid as shown at D, Fig. 19, with the head of the letters to the block A, *i.e.*, with the bottom of the line uppermost. We then take Fig. 20, and laying the piece E on the type with its ledge F resting against A and the feet of the type (we may have A full of letters or only a few; it will make no difference), get a piece of steel hammered out thin, somewhat like the blade of a pocket knife; I do not mean that one edge is thinner than the other, but that it is rounded off on both sides to a point in the middle. Make both edges round, then with a three-cornered file make a few notches near its point something like the teeth of a tenon saw, only rock the file so as to make the teeth form round the circle of its edge; the edge of the other side is left round and smooth. Lay the blade against E, with the teeth on the type; draw it backward and forward as if you were making a line alongside a straight-edge, and you will file out the groove with a few strokes, then turn round

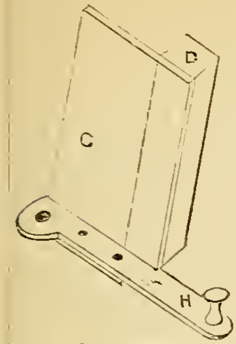


FIG. 16.—DIAGRAM SHOWING FRONT OF FUNNEL.

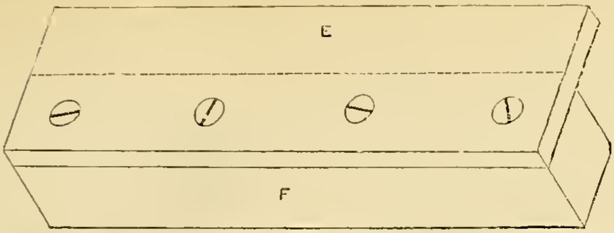


FIG. 20.—BLOCK REBATED FOR GUIDE TO FILE IN NICKING TYPE.

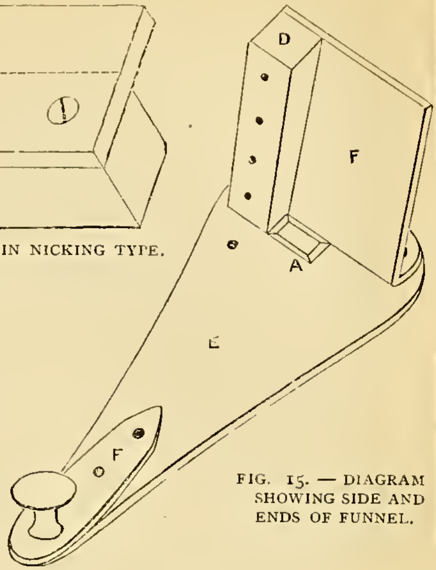


FIG. 15. — DIAGRAM SHOWING SIDE AND ENDS OF FUNNEL.

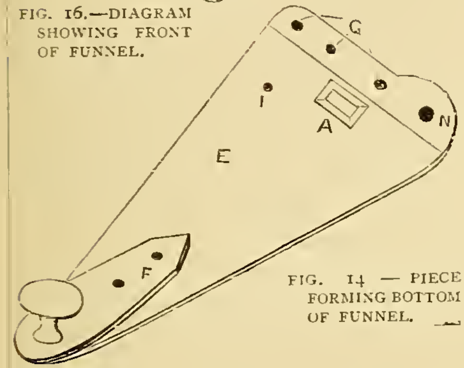


FIG. 14 — PIECE FORMING BOTTOM OF FUNNEL.

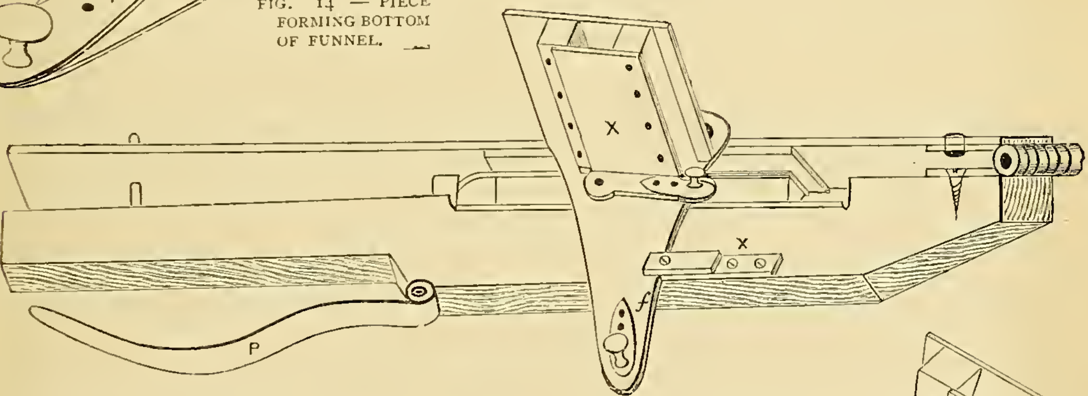


FIG. 18.—MOULD AND FUNNEL, COMPLETE.

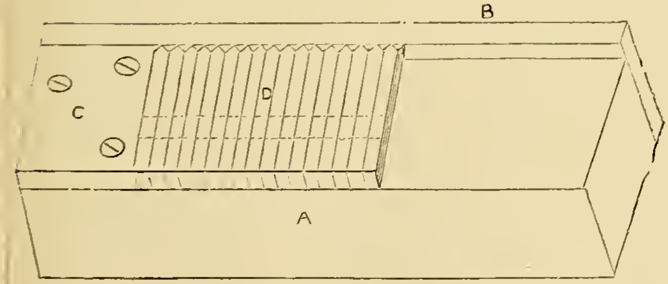


FIG. 19.—TYPE ARRANGED ON BLOCK OF WOOD FOR NICKING.

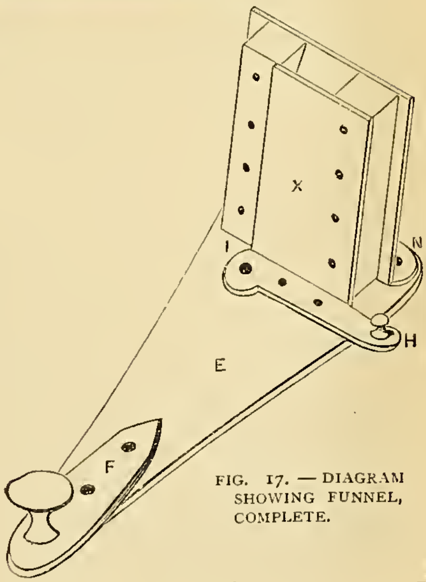


FIG. 17. — DIAGRAM SHOWING FUNNEL, COMPLETE.

the smooth side of the blade and give the groove a few rubs with it, this will burnish off any roughness left by the teeth. You had better tie a cord round the ends of this frame to hold them when cutting the grooves, for you need both hands—one to keep the type up firm against C, and the other to work the cutter. One groove might do, but type generally have two or more. When we put in the second one we take off Fig. 20 and lay a thin slip of wood on to the block A, level with the upper side of the type. Put on Fig. 20 as before, only it will have to grasp this slip. Now cut the next groove; it will depend on this slip how far apart the grooves are, and I would advise you to keep the slip that is once used, so as to get the grooves always alike in the case of casting some time after. If the grooves are not always the same it might lead to errors in setting up; and another thing must be noticed, to have the groove or grooves nearer the feet than the head of the letter. The eye will detect much sooner which end to put up than by looking at the ends. With regard to the feet, I find very little need be done. Regular type have a groove run on the end, forming their bottoms into two feet, and I cannot see that advantage would accrue if we have the ends cut square.

In conclusion, I would say, do not be deterred by this rather tedious description from trying it, for it is not such a serious job after all. With a good sharp, small struck file and a good bow drill, there is no fear of anyone not managing it. The only thing that requires extra care is to have the shank blocks square, the hinges of the mould and the matrix flap well fitted and firm. On these parts particular attention must be paid, and if you succeed in getting them right you will have a mould, not only for one alphabet but for any character of the same body, whether it be Roman, block or ornamental. You have only to put a lead into the matrix box, take the impression of the face, and you can turn them out bright and shining. Some may think it would be below them to use the trashy stuff here mentioned. I would say, by all means use the best you can get; only mind I was experimenting, and determined to be no expense when I was not sure of success. I have given my experience, such as it is, more with the view that the subject may fall among hands who will improve it, and give the readers of AMATEUR WORK the benefit of their superior contrivance. If there is anything not understood or any further information is wanted that I can give, I shall be willing, with the Editor's permission, to make all doubtful points as clear as I can in "Amateurs in Council." I have endeavoured to describe everything I did and every step I took as plainly as I can, and I do not think any one will find difficulty in following me from point to point in making a similar appliance.

OVERGLAZE PAINTING ON PORCELAIN.

By AURELIO DE VEGA.

XII.—FOLIAGE—FRUIT.

210. FOLIAGE IN GENERAL.—The indications given in the preceding sections will have put the student in possession of the mode of producing the leading tints required, and the greatest difficulty to be met with will be, not the production of the tint, but the appreciation of the natural hue of the objects or scene to be depicted, dependent, as this is, on so many accidents of circumstance. At the same time a few special hints may be useful. Those living in the country can always select their own time for studying nature in all its phases, but with town students, whose opportunities for getting "abroad" are few and far between, the case is different. Still these are not without helps to study, more perhaps, than they think. I will just mention one or two, and these will suggest others.

211. *Modelling Foliage.*—The great difficulties to the beginner, in the case of trees, are form and colour. As to form, it is sometimes impossible for him to *make out* with a view to effective light and shade, the disposition of the branching when the sun is on the trees, and the idea conveyed to him is much the same as that formed in a photo—a mass of foliage, some leaves shining and some flat, and that it is all; a mass without variation, without form. But let him look at the same trees in a diffused light, with, perhaps, even a suspicion of mist, and he will, I think, nearly always find that the foliage models most distinguishably. This will enable him to mark his shadows and lights in the painting, and, in addition, give him that breadth of view which, if equalled by corresponding breadth of treatment, will help to give his picture value.

212. *Colour of Foliage.*—As to hue, most trees are green. Yet, how great a diversity is there among greens. But that this diversity is not recognized by a very large proportion of students, is only too evident to any one who attends galleries in which the works of professionals or skilled amateurs, appear side by side with those of amateurs who, as yet, excel more in purpose than in execution. The greens of the latter are crude, and have a strong family likeness. But if they will take a little trouble, their eye may be well cultivated. Take a road flanked with various kinds of trees—lime, chestnut, poplar, sycamore, may, holly, laburnum, acacia—as may be found in suburbs, or take a park avenue; regard the trees on the length, fixing the attention on each for a minute or two; the eye will become accustomed to the green of one, and on transferring the glance to the next, the difference

in hue will be apparent at once. Proceed thus, and then regard the line of trees in sections, and then as a whole; and by this means a very correct appreciation of the differences will soon be easily and quickly made. It cannot be too strongly impressed upon the student that the colours of a tree's leaves are not the hues of the tree. These must be judged of solely from regarding the tree at such a distance as allows of the form of the tree more than the shape of its leaves, making an impression on the mind, and, therefore, such a thing as taking home a twig of a tree (as I have known suggested by a student) in order to work up a sketch, would be something like the pill-box of earth which Lord Dundreary received from his cousin, as a sample of farm land.

213. *Trunks, Branches, etc.*—Similar considerations apply to trunks and branches, which are mostly greys, in which sepia and German brown, modified by greens to give cast hues are employed. Occasionally, pale trunks, such as the trunk of the silver birch, come in, and other smooth ones in which green grey and curryish blotches, give a relief to an olive brown grey stem. In the former of these cases, pearl grey and grey black will be largely employed, the requisite tone being given by the suitable colour, for the latter one of the oranges tinged with green, and a touch of a warm brown will give the effect. When the trees are bare in wintry pieces, some of the paler trunks look perfectly effective in pearl grey splashed with black.

214. *Spring and Autumn.*—Spring tints are fresh and mostly transparent. Some, such as those of the poplar and sycamore, are warmish. Sèvres and roseleaf combined, are most generally useful for the former as local colour, modified as need be with light yellow or orange. For the latter, the introduction of a little chestnut with less roseleaf, answers well.

As the season advances, the leaves lose transparency. Roseleaf is now the basis, mixed with yellow and grey black. Frequently, under sides of leaves much in motion are bluish, and this may be made with tile blue greened, or blue green greyed, and the effect of the latter especially is great airiness.

Autumnal tints are much warmer, and here, when prominence is to be given to them—such as a gable with virginia creeper "going off." Vandyke brown, carmine. and orange, may every here and there be used even pure. Of course, in these cases, it is the presence of their bright hue that gives the effect by contrast with the shadow greens that enter largely into the composition, as regards withering foliage or the dull grey of stonework, or the greyed brunswick and chocolate brick.

215. *In distant foliage* there is but little, if any, marking; generally, the most done is modelling, the forms being flowing. The colours are mostly greys, more or less neutral, according to distance and atmosphere. In background shrubbery there is a little stem work, but beyond this, the working is but slight, and the foliage partakes of the nature of distant work.

216. In what may be called *foliage pieces*—such as those in which the subject includes a sort of bower, a bird with nest and leaves, or a floral subject with ornamental foliage—the leaves require special attention, and the veining must be brought out, and the delicate tones that give variety to the subject be observed and pourtrayed. In fact, in best work of this kind each leaf is almost a study in itself. But if decoration be the main object, and the piece will be hung at some little distance or height—broader work will be equally if not indeed more, effective, as being less encumbered with detail, which tends at a little distance to tone down the work; and will, as occupying less time, be more profitable. Thus on a primrose leaf, the reticulated effect of the honeycombing may be given by a very few adequate touches indicating the more marked lines of depression.

FRUIT.

217. *General.*—The principal points generally sought after, in the treatment of this subject on china, are brightness and prettiness. For assistance in these respects nothing helps so much as a study of good fruit pieces, of which a large variety will always be found in the leading public exhibitions. For practice in colouring, there are many good chromos to be had, but for finished work one should always paint from nature. Fruit has this advantage over flowers for amateurs who do not give long sittings to their work, that it keeps better and is perfectly still.

218. *The Paint.*—Assuming the subject to be well set, either from copies or from models, see to the paints. Mix enough—it will be found that at first, not a little will be consumed in attempts at blending and graduating, which will *not* produce the desired results.

219. *Classes of Fruit.*—For painting, fruit may be divided into two classes. A third might, perhaps, be added to include fruit with shiny skins, but the treatment of the last is not very special. Of blooming fruit, peaches, grapes and plums may be given as leading examples; of the other, apples and pears, although among apples, russets are to a certain extent blooming, and the leaves of pineapples are decidedly so.

220. *Non-bloom Fruit.*—In painting this, the great thing is to catch the hue, and here glazing may be largely resorted to. For instance, in many kinds of apples where tints, some pure, some composite, lie side by side in intimate enlacement, the easiest and most effective way is to lay one colour, which enters into the composite colour—scrape out for purity, fire and lay the other

appropriate colour. In this way, orange and yellow, green and yellow, or green and purple can best be rendered, and the striated markings be most readily made. Or again, the bosky shadow on some pears may best be made by washing them with German brown or sepia over yellow, blended with pale orange. Here also is good scope for the dabber. Much of the grain of fruit may most conveniently be thus produced. In this case, the process must stop short of perfect fineness, or the effect is lost. For this a coarser dabber is best, and the operation is conducted, not with the circular motion described for the production of a flat surface, but with a straighter direction ; and instead of the perfectly perpendicular action essential to success for the former, and the movement must be just appreciably dragging.

221. *Bloom Fruit.*—In taking this up, it is advisable to begin with a plum, principally because in it there is a minimum of variety combined with a fairly large surface to work upon. In oil painting, bloom is made with more or less white in the composition, but white is next to valueless for this purpose in china painting. It gives substance which is often undesirable, and fails to give the desired brokenness and tone. Bloom for this purpose must be effected by the employment of a self-colour. Thus, for purple fruit, one needs tile blue, for green fruit blue green touched most slightly occasionally with pink or carmine, while for peach bloom, and the bloom on children's faces, pink with tile blue, pink with blue, or carmine with tile blue may, according to the requirements, be found most serviceable.

222. *A Plum.*—Take a purple plum, the colours will be tile blue, purple and deep blue. For the last named, rose-leaf may on occasion be substituted. The first named alone is the bloom, and it must be laid thin, or it ceases to give the effect. The direct light is caught in this part. The local colour will be made out with purple either pure or with the slightest admixture of blue. This must be worked carefully and with reduced strength of tone into the still wet edges of the bloom. The shadow will be made out with purple and blue, or with the careful mixture of purple and green, which has been already described. The reflected light will be tile with a dash of purple. A fine dabber is needed for this purpose, and the process may be carried out to perfect fineness. This operation would result in the production of a perfect fruit. But the effect is heightened, and the result more pleasing, if in spots the bloom is supposed to be rubbed off, showing up the local colour beneath. For this, it is only necessary to give appropriate touches of the proper colour in or near the lighter parts. Purple grapes will follow the same general lines, but being smaller will require more experience and minute treatment. Any degree of intensity of colour may be had between carmine, purple and deep azure.

223. *A Peach.*—In this case the yellow and carmine tints should not offer any difficulty. The shadow requires careful management and manipulation ; and here the delicate grey tones which assist in imparting such beauty to this fruit, and making it so conspicuous a figure in a piece, may best be simulated by pearl grey, or a grey composed of blue green with a little carmine or a mixture of both, any of these being touched, when necessary, with grey black. Glazing with the latter mixed with the local tint is very effective. It should be scarcely necessary to have to point out that none of the greys used should be heavy. For the bloom in this case carmine and tile blue will generally be found most serviceable, even better than the mauve which Mr. Hancock speaks of as being peach bloom, and pink and tile may also be used. Various mixtures of the gold colour and the blues will suggest themselves to the student as he progresses.

224. *Green Fruit.*—For this the procedure will be similar ; the bloom in this case may be made with blue green, to which the merest touch of carmine has been added to break it. The carmine must be in very minute quantity, or the resulting colour will approach a French grey.

225. *Shimmery Fruit.*—As regards fruit of this nature, such as currants, the peculiar nature of ceramic colours largely assists the artist, as great translucency is thereby obtainable. In white currants, the most realistic effect is obtainable. For the spot the ware should be left bare ; the shadow markings may be made with pearl grey; and various tones of yellow with a touch of German brown, and blue green slightly broken, all contribute to the general effect.

(*To be continued.*)

HOW I MADE MY OVERHEAD MOTION.

By E. BURSLEM THOMSON.

THERE are, I doubt not, many amateur turners who would have sympathised with me, when, some time ago, I found myself in the following position. I had a turning lathe and a fair assortment of tools, but there were two things which I had not : the one was money, the other an overhead motion ; the first I could not raise, the second I thought I could, and I did, with a success far surpassing my expectations. In case, therefore, any brother amateur turner should find himself in a similar position, I venture to write these few lines, as I hope, for his benefit.

In the first place an overhead motion should be rigid, more especially if any fine work in hard wood

or ivory is to be done, and to this end, the framework bearing the wheels should be supported on either side of the lathe. Fig. 1 is an example where the framework is not supported at each end, and consequently the whole strain is at the junction A, and the vibration is considerable.

To proceed now to carry out my plan. Procure two round bars of iron 1 inch in diameter, and 7 feet in length. I used solid iron, but should say that iron tubing would do almost as well. These are to be dropped into wooden sockets, Fig. 2, which may be nailed or screwed to the floor at the distance apart of the length of the table or bed supporting the lathe. They must be fixed to the table or bed of the lathe by a staple, or any other method which may be convenient. I fixed mine by means of a small piece of wood, Fig. 3, screwed to the side of the table of the lathe. The hole at Fig. 3, not being quite a complete circle, the surface of the iron bar projects slightly, and, on the screws being tightened, is pressed against the side of the table, and becomes firmly fixed.

These uprights being placed in position, you must obtain from a gasfitter two cross-pieces, such as are used for joining gas pipes, Fig. 4, which at A, must be tapped to fit 1 inch tubing, and at B and C be $1\frac{1}{8}$ inch, and at D $\frac{1}{2}$ inch, or $\frac{3}{8}$ inch will do. Next procure a piece of 1 inch iron gas tubing, with a screw cut at each end to fit the hole at A, Fig. 4. The length of this tubing will, of course, depend on the distance apart of your uprights, on which, when you have screwed your cross-pieces at either end of the tubing, they should slide evenly up or down, a set screw, D Fig. 4, in each cross-piece, fixing it at any point.

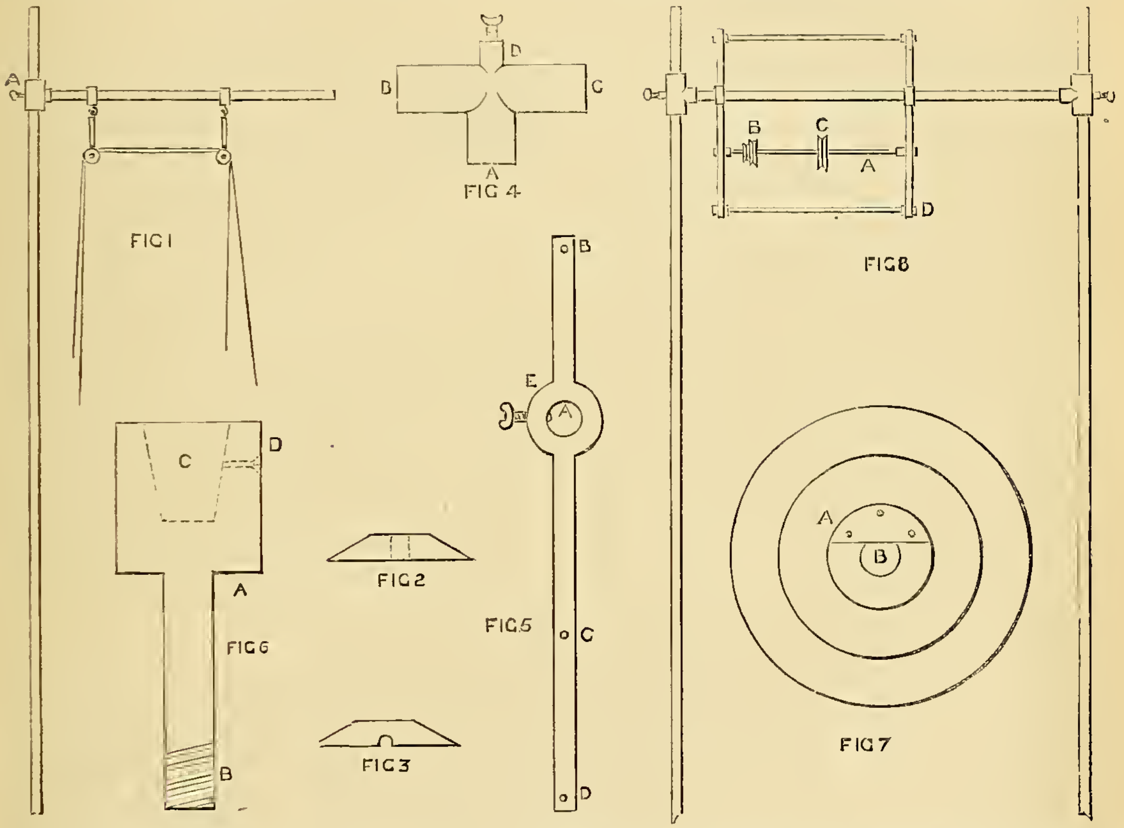


FIG. 1.—OVERHEAD WHEN FRAME IS NOT SUPPORTED AT EACH END. FIG. 2.—WOODEN SOCKET FOR IRON BARS. FIG. 3.—CLAMP TO FIX BAR TO BED OF LATHE, ETC. FIG. 4.—CROSS PIECE OF GAS TUBING TO SLIDE ON BAR. FIG. 5.—WOOD MODEL FOR SIDE BARS OF FRAME. FIG. 6.—BEARING FOR SPINDLE—FULL SIZE. FIG. 7.—BRASS PLATE ON EITHER SIDE OF PULLEY. FIG. 8.—OVERHEAD MOTION, COMPLETE.

Now get a piece of wood $\frac{3}{4}$ inch thick, and cut it to the shape of Fig. 5, boring at A a hole of a size to fit over the sliding gas tubing already put up. This pattern is to be $\frac{3}{4}$ inch square in all its parts, and 1 foot 6 inches long. Take this to any blacksmith, and get him to forge two similar pieces out of some $\frac{3}{4}$ inch

square iron bar. They need not of course be filed up, or finished in any way, except for appearance. Now bore $\frac{3}{8}$ inch holes at B, C, and D of these irons, Fig. 5, being careful that they are in the same straight line, and parallel to one another, since on this, as you will see, depends to a great extent the satisfactory working of your spindle, A, Fig. 8, in its bearings. It is a good plan to clamp the irons together and bore the two at one operation. Next cut a thread about 2 inches long at each end of two iron rods $\frac{3}{8}$ inch diameter and 20 inches long (I give these measurements as I used them myself, but they can, of course, be varied at pleasure), and fit two nuts to both ends of each rod. These are to be used as shown presently.

Now come the wheels, and spindle with its bearings. The first I need say nothing about, being ordinary wooden pulley wheels. The spindle is to be made out of a piece of bar iron of about $\frac{5}{8}$ inch diameter, turned true, and coned slightly at both ends. For the bearings, turn a piece of brass as at Fig. 6, the part A to B fitting well in the hole at C, Fig. 5, and cut a screw and fit on a nut at B. A hole should be drilled at C, and coned to fit the ends of the spindle, and a small hole at D for lubricating purposes. Upon the spindle you may now fit your wheels. There are two or three ways of doing this, but I think I used the simplest means, by filing a flat surface on one side of the entire length of the spindle, whilst in order to make the wheel C, Fig. 8, movable, I screwed a small piece of brass on either side, as at A, Fig. 7, so as to allow of the spindle passing stiffly through the hole B. The wheel then remained fixed at any point, and required no set screw or other means of adjustment.

You now have the framework ready to put together. Fit the bearings, Fig. 6, through the holes at C, Fig. 5, of your forgings, fixing them firmly with a nut outside, adjust the spindle between them, and then run your iron rods respectively through B and D, Fig. 5. These keep the irons, Fig. 5, in position, by screwing up the nuts at each end (one nut, of course, being inside, and the other outside, D, Fig. 8). They must be carefully adjusted so that the bearings work easily and without play. When they wear loose, you have only to loosen the inside nuts and tighten the outer ones, which will regulate them to a nicety.

You have now only to slide the framework over your iron cross bar (which, of course, will run through the holes A, Fig. 5), fixing it by means of set screws, E, Fig. 5, and you will have an overhead motion which will have cost you at the most 25s., and than which, if it only works as satisfactorily as the one I have put up, you will never wish for better.

It may perhaps seem to some that I have used an unnecessary amount of ink and paper in describing a rather simple contrivance. I have endeavoured, however, to explain it so that even the most unskilled and uninitiated may understand, and be able to adapt it to their own requirements. Should I have achieved this result, I shall feel it to be a good interest on my investment in stationery.

MY FURNITURE, AND HOW I MADE IT.

By MARK MALLETT.

V.—MY "BEACONSFIELD" WARDROBE.

ALTHOUGH a wardrobe of the kind shown in elevation in Figs. 36 and 37, is an article of very recent introduction, there can be no question as to its great utility as a piece of bedroom furniture. Within moderate compass it affords a wonderful variety of conveniences. In a space 6 feet 3 inches high, 4 feet wide, and 18 inches deep, we have a hanging press, a cupboard fitted with sliding trays, a set of short drawers, varying in depth from $3\frac{1}{2}$ inches to 7 inches; a long drawer 10 inches deep, and a large mirror. To construct an article combining so many accommodations will, of course, involve somewhat more contrivance and labour than the making of many of our pieces of simple furniture; but when we enter upon its details we shall see that there is nothing in the undertaking beyond our powers.

For an article of this size considerable strength in materials will be essential; the sides, top, bottom, and principal partitions should therefore be of inch board.

In Fig. 38 is shown one of the sides from within. It is that to the spectator's right hand as he fronts the wardrobe, and the arrangements are therefore those required for the cupboard and short set of drawers. The pieces which form this side are 6 feet long; and as it is 18 inches wide, two 9-inch widths will doubtless be used. If the workman can get these boards grooved and tongued together, so much the better. But the chances will be against this; and if not, he will find the arrangement of dowelling, before spoken of, sufficient for his purpose. Indeed, this particular side will be so closely bound together with ledgers, that the joints can be in little danger of moving if the wood be properly seasoned. In the opposite side, however, that of the hanging press, where there are few ledgers, dowels will be more needed.

It will be seen that down the back edge of the side (at J, Fig. 38) a rebate is shown half an inch wide. It is also half an inch deep. This is to receive the edge of the boarding of the back, as will be seen by reference to Fig. 39. If the workman has no rebate plane with which to sink this, he can cut it sufficiently

well with the chisel, as no special neatness will in this instance be necessary.

At its front edge (K, Fig. 38) the side is shown to he cut away to a depth of an inch and quarter. This is to admit the door of the cuphoard, which is of that thickness, and which will have to be hinged to it. In the other. the left-hand side, this cut will have to he much longer, reaching downwards to the upper line of the mortises B, B, to admit the much larger door of the hanging press.

The mortises A, A, in this diagram (Fig. 38) are intended to receive the tenons of the bottom. Those above, marked B, B, are for those of the shelf which lying ahove the long drawer forms the bottom of the hanging press. Those marked C, C, are for the support of the shorter shelf, which forms the hottom of the cuphoard. As the ends of the tenons of this shelf would he unsightly if allowed to pass through to the outside of the wardrobe ; and as sufficient strength is to he gained without their doing so, these mortises need only he sunk half an inch deep.

The openings D, D, are for fixing the top ; and the whole structure will be more firmly hound together if these openings are shaped as dovetails. They are so shown in Fig. 39, in which the upper edge of the side and the end of the top are drawn.

The ledgers E and F serve respectively to give support to the top and bottom, as well as to hrace together the two pieces of the side. They may be made of strips of three-quarter inch board, 2 inches wide. The smaller ledgers G, G, G, which are three-quarters of an inch square, are to serve as runners for the short drawers. They come to within three-quarters of an inch of the front edge of the side only, hecause in front of them and to them, similar strips will have to he screwed, which will form the divisions between the drawers.

The ledgers H, H, are of the same size, and are intended for the trays to slide upon. These trays will run between H and I ; the smaller ledgers I, I, being set where they are, to keep the upper edges of the trays in place.

The opposite or left-hand side of the wardrobe will resemble that before us, except in some few respects. It will require no ledgers for the support of drawers or trays ; it will not have the mortises at C, C ; and, as before mentioned, it will need a much longer cut for the door, which has to be hinged to it.

The top, the bottom, and that shelf which covers the long drawer, will all best be made of inch wood, though, if desired, a little lightness may be gained without any serious loss of strength, by making the *bottom* of three-quarter inch stuff. I have, however, shown them all as made of inch hoard. They will alike be 3 feet 8½ inches long, exclusive of their tenons, which will give them an extra inch of length at either end. Their width will he 17½ inches, since when placed against the sides they will reach no further hackwards than the rehates, the boards of the hack having to be screwed hehind them. The top, as may he seen in Fig. 39, is fixed hoth by screws passing downwards through it into the sides, and by other screws which pass horizontally through the sides and into it. The shelf and bottom have to he fastened hy large and strong flat-headed screws passing into them through the sides, hetween their tenons. The heads of all these screws will eventually be hidden by the base-boards, crest-hoards, and moulding which show in the elevations. If not tongued, a dowel or two in top, bottom, and shelf, will be useful to keep their component pieces in place.

The partition which divides the upper part of the wardrobe down its centre, and whose front edge shows conspicuously in the elevation, Fig. 36, is also to be of inch board. In width it will be the same as the top and shelf, into each of which it will have to be let by a couple of mortises. To cut large mortise holes through the centre of the shelf, the point at which it most requires strength to meet the heavy strain which will be put upon it, would by no means be advisahle. It will suffice for the mortises to be half an inch deep hy an inch and a half long. The height of this partition from shelf to top is 4 feet 5 inches. The half inch tenon at each end will hring it to 4 feet 6 inches of total length.

On the right or cuphoard side, this partition will have to he made the counterpart of the corresponding portion of Fig. 38. On the left or press side, it will need only a strip of half inch wood, say, an inch and half wide, and long enough to run from top to hottom, screwed against it. The front edge of this will have to be set an inch and quarter hack from the front edge of the partition. Its back edge should be carefully hevelled off. This strip will be for the door to shut against.

The short shelf which comes at C, C, Fig. 38, and forms the bottom of the cupboard, is also an inch thick. Its width is the same as that of the partition, top, etc., that is, it is half an inch narrower behind than the sides. It will not he possible to mortise the end of this shelf completely through the side of the wardrobe, like that of the larger shelf below, because we shall here have no outer moulding to conceal the unsightly ends. We must, therefore, content ourselves with taking the tenons half way through the side, and there securing them with round-headed screws from without, which will not be unsightly. We may either drive two screws into the centres of the tenons, or four longer ones into the wood in either side of them, as indicated by the dots in the last-named figure.

And here I may pause to observe, that in this kind of amateur carpentry there are great advantages in always using screws, and forgetting, if it may be, that such things as nails were ever made. The use of screws, it is true, often seems to cost more time, and certainly does cost more money; but still the advantages attending their use far more than counterbalance the disadvantages. With the screw there is comparatively no danger of splitting the wood, the surface of which also escapes being dinted and disfigured by hammer marks; the screw can be driven wherever the workman pleases, whilst the nail has often a perverse way of following its own evil courses to the no small injury of the work; and, not least important, the screw can always be regarded as a merely temporary fastening, which may be removed easily without doing harm, whenever occasion may require it.

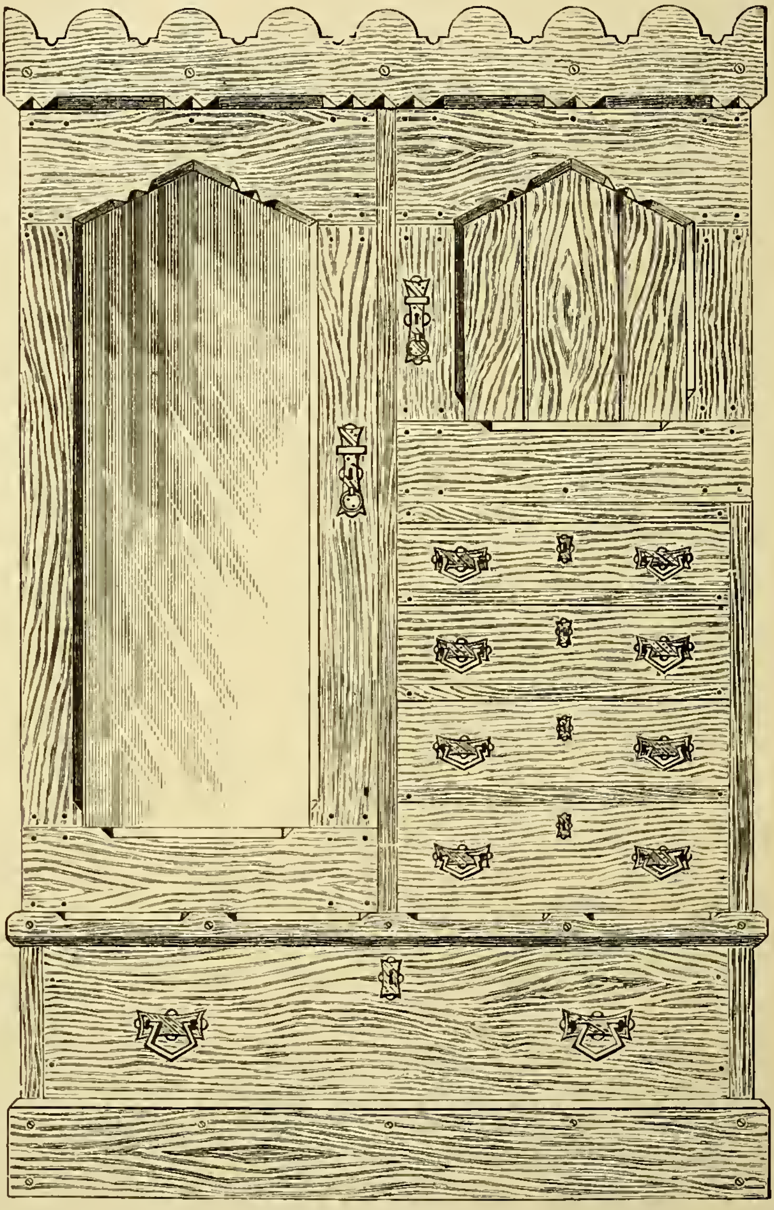


FIG. 35.—MY "BEACONSFIELD" WARDROBE—FRONT ELEVATION.

Having arranged our framework as above, with its three horizontal and its four vertical pieces, and screwed them tightly and *squarely* together, we may proceed to give it a back. Half-inch match-boarding, which comes to our hands ready planed, and tongued and grooved, is the material for this purpose. From eight 6-feet lengths of the width at which match-boarding is most commonly sold, we shall have a strip to spare. This backing, when securely fixed with small screws to the uprights and cross-pieces, will render the whole firm and rigid. And having thus formed what we may call the carcase of our wardrobe, we may next go on to complete its strength and solidity by adding those outer pieces, which at the same time tend to render its form more ornamental.

These are all of three-quarter inch wood. The base-boards which case the bottom at front and sides, are 6 inches deep, and are screwed in position as shown in the two elevations. Above them, its top being 18 inches from the ground line, comes a moulding 2 inches wide. The end strips of this moulding cover and conceal the tenons of the shelf. The front strip, in addition to its ornamental purpose, is designed to give additional strength to the shelf. This shelf has a heavy weight to bear at its centre, and needs all the support we can afford it. The moulding is strongly screwed to it, and that these screws may be driven well into its middle,

without their heads showing unpleasantly near the upper edge of the moulding, is the motive why that upper edge is bevelled in the manner indicated. The lower edge of the moulding is bevelled off plainly.

The ornamental crest-boards are like the base 6 inches deep. When fixed, one-half of their height rises above the top of the wardrobe. Their forms are shown in the elevations with sufficient clearness for working purposes.

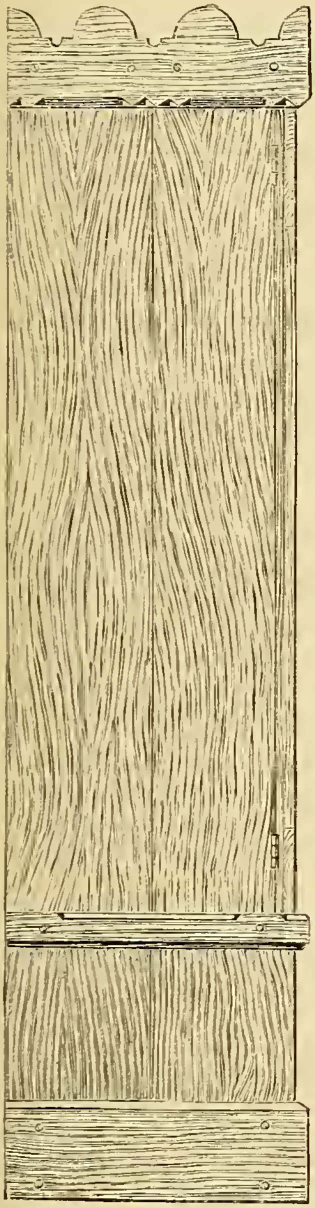


FIG. 37.—END ELEVATION OF WARDROBE.

The interior fittings of the hanging-press will be extremely simple. Half a dozen brass pegs, $2\frac{1}{2}$ or 3 inches long, will have to be provided—two for the back and two for each of the sides, and attached to strips of board of proper lengths. These strips are to be screwed to the back and sides at such a height as will permit of any article of clothing being hung upon them with ease—say, within 4 inches of the top.

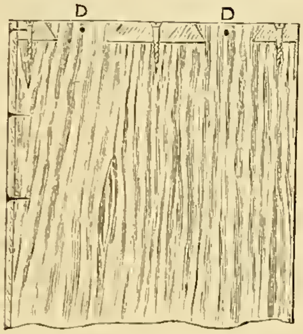


FIG. 39.—END OF TOP OF WARDROBE.

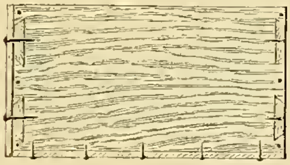


FIG. 42.—SIDE OF DRAWER OF WARDROBE.

FIG. 41.—SIDE OF SLIDING TRAY.

FIG. 40.—PLAN OF SLIDING TRAY.

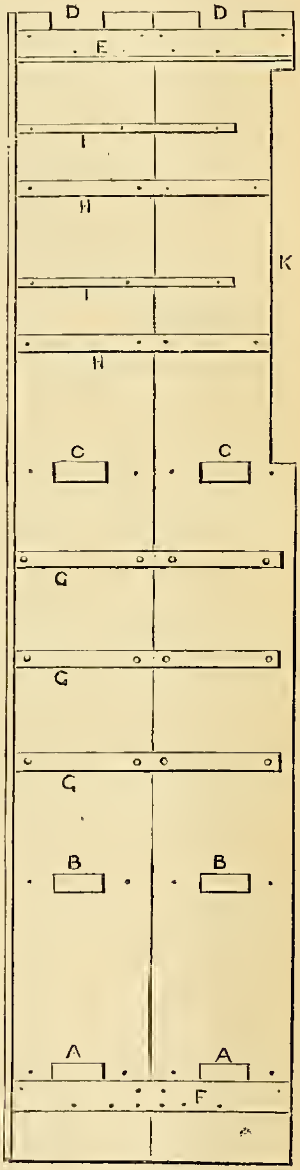


FIG. 38.—SIDE OF WARDROBE FROM WITHIN.

The fittings of the cupboard will involve rather more labour. It will need two sliding trays. The plan of one of these is shown in Fig. 40. Its front is open. The sides and back are strips $2\frac{1}{2}$ inches deep, to which the bottom, half an inch thick, is screwed. We have one of the sides in Fig. 41. As a handle by which to draw out the tray, a finger hole is cut through

its front. The edges of these trays should be very neatly rounded and sand-papered off, as they will come much more under the hand and eye than ordinary drawers.

Our method of constructing doors has already been fully detailed in former articles; and of those before us it needs only to be said that they are made stouter than ordinary, to enable the larger one to support the extra weight of the mirror. The outer thickness is therefore of three-quarter inch wood. A plate of looking-glass, $42\frac{1}{2}$ inches by 15 inches, will be required; and to fix it we must sink a sufficient rebate in the underside of our outer thickness of wood, half an inch wide at the bottom and sides, whilst at the top we must sink the surface of the wood to a square of the height required.

For the front of the long drawer, which is 10 inches deep, it will be well to use inch stuff, and for the sides and back three-quarter inch. The sides should be dovetailed into the front to a depth of three-quarters of an inch, as is shown in the diagram of side of drawers, Fig. 42. If the workman shrinks from the difficulty of thus dovetailing it, he may attain his end with less labour by using instead of inch board, two thicknesses of half inch, and dovetailing the sides into the inner one of the two; the outer one can afterwards be screwed on as a false front. The bottom of half inch wood may be merely screwed in its place.

The smaller drawers maybe made somewhat more lightly. If they are, as they ought to be, dovetailed together, half-inch wood will serve for their backs and sides, though even for these, inch wood should be used for the fronts. For the two shallower drawers, quarter-inch board will be strong enough for the bottoms.

All the diagrams used to explain the construction of this wardrobe are drawn to a scale of one inch to the foot, its parts being so simple that no working drawings on a larger scale will be necessary.

I have now nearly completed the description of the various articles of furniture that I made for my bedrooms. I have, however, yet to give some account of my chest of drawers, which will, in more than one particular, present some novel points of construction, and of my attempt at a bedstead, which was by no means unsatisfactory — at least to myself. It is said that every man feels much more satisfaction in using any article that he has made himself, and for himself, than he has in doing exactly the same thing or going through precisely the same process with a similar thing that he has purchased from the maker. I can support this by saying that I had infinitely more pleasure in using the furniture of my own make, than I should have experienced in handling the very best that Jackson and Graham could produce. (*To be continued.*)

A CHEMICAL LABORATORY FOR AMATEURS.

By P. CARMODY,
Of the Inland Revenue Laboratory, Somerset House.

I.—NECESSARY APPARATUS—THE BENCH AND ITS FITTINGS.

WE are so familiar with the saying, "that a little learning is a dangerous thing," that we are generally ready to accept the statement as an unqualified and undeniable truth; but it is the intention of the writer to show in these articles that a little chemistry is, although dangerous perhaps, *a very useful and profitable* thing occasionally. The term "dangerous" is, perhaps, more applicable to chemistry than to any other branch of learning, as many a chemical anecdote would prove; but many an amateur would willingly risk the element of danger for the sake of the accompanying good. The danger is small if only care and attention be exercised; and the advantage is always great.

Many a time have we seen an amateur asking some very simple information in chemical matters—some simple method for determining the purity of a particular substance in which he was interested—some hint that a chemist could readily give. The object of these lessons is to assist the amateur in the practical examination of such substances as he may meet with in the commercial world; and in order to prepare the way for the fulfilment of this object to give such assistance in the setting up of a laboratory and the necessary apparatus as our experience suggests, always keeping in view the desirability of making the fewest and smallest possible demands on the purse of the amateur.

The Bench.—This is the first important item in the amateur's outfit. Those who have a taste for carpenter's work will have no difficulty in making one. It may be as simple or as elaborate as taste or necessity may direct. We will simply make a few remarks here on the most suitable dimensions and fittings. The bench should not be so high as to reach to the elbow when the future owner stands in front of it. It will generally be found more convenient to place it against a wall; and, if possible, in a part of the house or office where a supply of water and gas can readily be obtained. The front of the bench may be divided medially by a vertical line, the half to the right fitted with drawers, some shallow and some deep; the half to the left formed into a cupboard with one shelf.

The horizontal part of the bench on which the apparatus stands, should be at least 6 feet by 3 feet. It may be of plain wood; but if it be covered with a

layer of asbestos sheeting so much the better, as this sheeting is not injured by corrosive chemicals or by heat. On the left hand side over the cupboard should be made a large hole, into which a porcelain wash basin is fitted. This basin should have a hole and plug at the bottom, and should, if possible, be connected by a pipe with the sewer. If this latter is impracticable, a large porcelain vessel should be placed in the cupboard below to receive the washings from the basin; but as this vessel has to be emptied periodically, and is apt to be forgotten until an overflow reminds us of this duty, it is evident that it is a very great convenience to have a pipe leading to the sewer. This pipe should be of lead, and as short as possible. It may frequently require to be cleaned out with a cane. Our next consideration is the water supply. A pipe from the tank with a tap directly over the basin would be most convenient; but when the quantity of water required is not large, the cheapest way is to place a wooden, or zinc, or other cistern on a shelf over the basin, and drawing the water from a tap in the side or bottom of the cistern.

Next, as to shelves for the bottles holding the reagents. Three shelves the entire length of the bench will be ample. The lower shelf may be 10 inches above the horizontal top of the bench to allow of the full width of the bench being utilised; the next shelf 8 in. higher; and the third 6 in. from the second. We recommend to readers the Chemical Cabinet described in Vol. III., p. 101. This could readily be fixed on a bench, and will be found particularly useful.

Our bench is now complete with the exception that we have made no provision for a source of heat. If gas can be laid on so much the better. Nothing is more convenient. If not, a spirit lamp must be used, and has this advantage, that it does not require special fitting. (*To be continued.*)

A SIMPLE HAT AND UMBRELLA STAND.

By ARTHUR C. HIDE.

EVERYBODY that reads this Magazine has, I am quite sure, a "hat" (I don't mean to say that people who do not read it have not got one, but I simply state that as an apology for bringing this paper before them); and if he has not already a suitable place in which to dispose of the said hat or hats, he may construct such a place by carefully following out the instructions, and studying the drawings given here. And now to work.

Firstly, you must decide upon the wood to use. I think oak, if you can procure a nicely-grained piece, is the best wood, both for looks and for ease in working. You can, of course, use mahogany, if you like; but I think it would scarcely look as well as the oak, the whole style of the structure being better adapted for the latter than the former. Should you happen to have hall chairs, perhaps it would be advisable to match the stand to them; but all this is merely a matter of taste, and, as tastes differ very materially, I can only say that for those who have nothing to match, or are more for ease in working than for details in looks, I should again advise oak.

Having decided, then, we will say, upon using this, you must be on the look-out for a place to procure it, and where you can rely on the wood being well seasoned and dry. Where I bought mine, I found the dealer had some pieces 6 feet long and 6 inches wide, by 1 inch thick, so upon these I immediately pounced, and procured half a dozen, which amply covered my wants for the uprights and cross-rails. For the tables and drawers you must, of course, use what you can find. If you can get a large $\frac{1}{2}$ inch board a good foot in width, all the better; get it by all means; but as I rather expect you will find this a considerable difficulty, you will probably have to make wood of a less width do, and have to join two pieces for the tables, or rather tops of the drawers.

In fact, you must first go to your timber-yard, and see what sized stuff is obtainable there, and then go home again, and work out the most convenient size, and the one which is likely to entail the least amount of waste; for, as every timber yard has, to a certain extent, differently-sized stuff, it is impossible to lay down a hard and fast rule for fixing the quantity required, and the dimensions to which you must keep. Your judgment and the 2-foot rule must guide you.

The wood obtained, plane up as many pieces $2\frac{1}{2}$ inches wide and 1 inch thick as you require. Here, again, it will depend upon the length of your wood, for, if you can plane up two or three pieces in one length, all the better; but, in cutting them apart, do not forget to allow for the tenons on each side of such pieces as may require them. It is as well to number each piece as you cut it, and plane it up with the same number or figure as on the corresponding piece in the drawing. This prevents you cutting the same piece twice over, as you are liable to do when there are a number of pieces all the same width and thickness.

When you have got these cut and planed, there ought to be the following pieces, sixteen in all:—

A, A, 2 pieces............each $2\frac{1}{2}$ in. by 1 in. by 5 ft. 4 in. (about).
B, B, 2 pieces............each $2\frac{1}{2}$ in. by 1 in. by 5 ft. 11 in.
C, C, 2 pieces............each $2\frac{1}{2}$ in. by 1 in. by 3 ft. $\frac{1}{2}$ in.
D, E, F, G, 4 pieces ...each $2\frac{1}{2}$ in. by 1 in. by 2 ft. 3 in. (about)
H, 1 piece.................. $2\frac{1}{2}$ in. by 1 in. by 4 ft.
J, 1 piece .... $2\frac{1}{2}$ in. by 1 in. by 2 ft. 2 in.
K, K, 2 pieces............each $2\frac{1}{2}$ in. by 1 in. by 8 in.
L, L, 2 pieces............each $2\frac{1}{2}$ in. by 1 in. by 1 ft. 3 in.

These, of course, do not include any of the drawers, etc., and, when put together, constitute only the framework of the stand. You will see that some of the pieces have bevelled, or, rather, sloping ends. Of these, the dimensions given are the exact length, so that in their case you must be careful when cutting the stuff not to cut too short, but rather a little longer, and plane it off afterwards. But with the others it is not of much consequence, as in every case where the piece has to be tenoned I have allowed $1\frac{1}{2}$ inch a side, and as you will require $1\frac{1}{4}$ inch, at most, there need not be much fear about the pieces being cut too short.

Now, when that is done, take the three pieces, D, E, F (not G and J), and, laying them close together, square off the tenons from all three, at the same time making the solid part between the tenons 2 feet long. This ensures them being exactly the same length, for if D and F should be even a trifle longer than E, the joint would, as is self-evident, show very much between E and B.

The piece G, you will perceive, has to be $\frac{1}{2}$ inch on each side—that is, 1 inch altogether (not taking the tenons into account) longer than either D, E, or F, because, as it stands 6 inches from the back-rail, F, it has to touch the sides of the drawer boxes (in fact, is mortised into the sides), and as they stand $\frac{1}{2}$ inch inside the edge of the pieces B, B, of course G has to be 1 inch longer in consequence. J will have to be squared up to 2 feet 2 inches exactly, as it has to be dovetailed into the side-pieces, K, K.

Cut the tenons on L, L, and bevel them as shown. The piece D, by the bye, should have the tenons also bevelled, as shown. The reason requires no explanation.

Next mark off, also, on both at the same time the mortises in B, B, and A, A, and be very careful to get them on the respective pieces exactly the same distance from the end.

Now score out to half depth the piece H, running along the bottom of the stand, in the places where A, A, and B, B join it, and the ends of these pieces will have to be scored out in like manner to fit flush. A A will have to have half-lap dovetails at the bottom, to prevent the joints being seen from either side.

Now bevel and score out, also, to half depth the pieces C, C, and the other ends of A, B, B, A, where these cross. To ensure the angle being correct, set it out to a larger scale, and then take it from that with a bevel.

A little "fudging" must be done here, I am afraid, and that is to make the pieces C, C a little shorter, so as to press the uprights A, A and B, B close on to the cross-pieces, D, E, and F, and thus ensure good joints. It need only be the very least bit shorter—too much would either bend or split the wood.

See that all your tenons and mortises, etc., fit nicely, but not too easily, together; and then, having all the parts handy, begin by gluing and fixing D, E, and F into their respective places in one of the pieces marked B; that done, fix the other piece B into its place, and then L, L and A, A.

Next glue H into its place, and screw with $\frac{3}{4}$ inch No. 12 brass screws from the back. Having done likewise with C, C, you will have your stand pretty well into shape. Should any of the joints happen to be open, pour some hot glue in, and cram as much sawdust in after it as you can—this will make it appear quite close. As this structure will not stand upright at present, the foot will naturally engage your attention next. For this, dovetail K, K, respectively into each end of J, having previously cut the tenons on the former pieces—not in the centre, as usual, but well towards the top side, as dotted in the drawing. That done, cut the mortises for these tenons right through H and B, taking care to make the latter fit well. Glue and wedge these into their places very tightly, and then put a $3\frac{1}{2}$ inch No. 20 brass screw into each of the places left below the tenons, as shown in the drawing.

And now for the drawers, etc. For the cases of the drawers, firstly, make the two sides, and dovetail them into the backs with a lap dovetail, so that the joints are not seen from outside. You must have backs to these outside cases, in order to screw the same to the uprights.

That done, you must put the tops (which will form the tables) on. The simplest way will be to cut pieces out with a gouge from the insides, and screw a narrow screw through from the notches so made into the top. Two of these notches in each of the sides and two in the back, will be found amply sufficient. Take care that the heads of the screws be below the level of the surface of the wood, else the drawers will not run easily.

Now, for the bottom of the boxes or cases, you may either put a flat piece over the bottom of each, projecting $\frac{1}{2}$ inch each side and in the front, like the top, or you may put three separate pieces on each. I think the latter plan preferable, and have therefore drawn it out so. You must fit the corners as shown, so as to allow room for the screws in each of the front pieces.

I shall not go into the details of the drawers themselves. You can copy one of those which all who read this are sure to have at home, but I may advise you to take as a copy the best one you can find, and imitate it even to the direction of the grain of the wood. This is very important in a drawer, for if the several pieces of wood are not rightly placed, in hot weather the drawer will run much more tightly than in cold.

The boxes can now be screwed on to the frame, which had better be done from the inside of the boxes.

SCALE FOR ALL FIGURES,
1 INCH TO 1 FOOT.

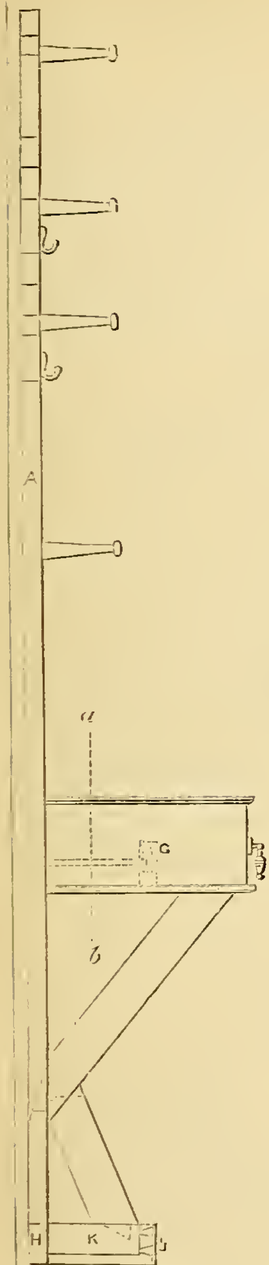


FIG. 3.—SIDE ELEVATION.

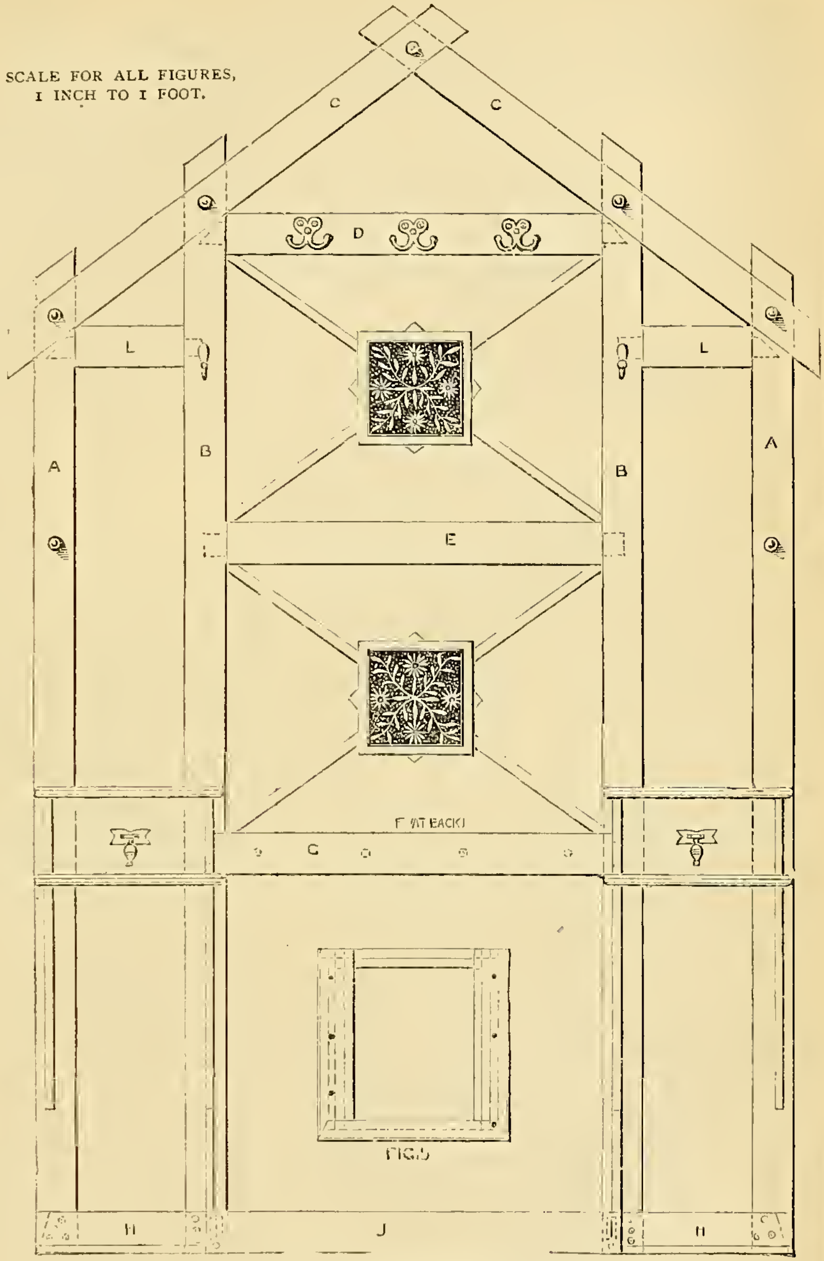


FIG. 1.—FRONT ELEVATION.
FIG. 5.—VIEW OF UNDERSIDE OF DRAWER OF TABLE.

FIG. 4.—SECTION IN *a b* IN FIG. 3.

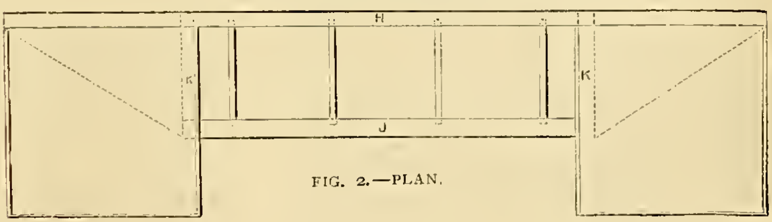


FIG. 2.—PLAN.

Before screwing them in place though, you must cut mortises for the front-piece, G, and drill holes in that and in F, to take the cross-bars. For these I used ordinary curtain rod, and found it answer the purpose capitally.

The struts, M, should also be put in before quite screwing the boxes in place. For the other two struts, N, N, you must mortise the bottom ends respectively into the pieces K, K, and, having cut off the tops to fit nicely against M, M, glue them, and put a wooden peg in each, and cut these off flush.

Next, a zinc pan to fit into the foot with cross-pieces to correspond to the brass rods above will, I think, complete the arrangement, except the ornamentation.

For this I got some blue tiles, glued slips of wood (oak in my case) round the edges, so as to make a sort of frame, and little triangles of the same wood on the sides, and let the whole into and flush with two cross-pieces, reaching from corner to corner of the two centre open spaces, fixing them with screws through the cross-pieces into the frames of the tiles.

Tiles of a similar pattern framed in a like manner, and fastened to the tops of the tables gives a pretty appearance to the whole, and serve as stands for flower-pots, etc.

Double brass hooks on D, for the coats, and small hooks on B, B, for brushes, etc., not forgetting the hat-pegs (which should be turned with a shoulder, and fixed by letting them through to the back, and then driving a wedge with glue into a slit previously cut in the pegs), and the quaint little handles for the drawers, finishes, I think, the whole.

I must apologize for engaging my readers' attention for so long a time over such a simple matter, and can only add that any questions they may wish to put through the medium of this Magazine will be answered with pleasure by, and to the best ability of, the writer.

HINTS ON THE UTILISATION OF WASTE MATERIALS.

By R. LEWIS.

III. — BOTTLE STAND — PINCUSHION — POT COVER — BRACKET FOR WASHSTANDS, ETC.—RAZOR STROP—FENDER—PENCIL SHARPENER—COPYING FRAME—ANVIL FOR TINS.

BOTTLE STAND (Fig. 25).—On the base, A, erect two perpendicular pieces, B, of the required height, and on the top of these fix the perforated piece, C. The whole may be rendered more steady by triangular brackets, D, D, and if the stand is to be used for test tubes or other spherical bottomed vessel, it will be as well to make small perforations in the base, E, immediately under the centre of the holes in the upper piece.

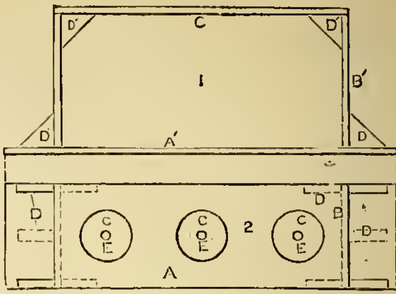


FIG. 25.—BOTTLE STAND.
1, Elevation of Stand; 2, Ground Plan.

Pincushion (Fig. 26).—Take a matchbox, and more than fill it with sawdust, bound together with a weak solution of glue or size, and while warm it can be

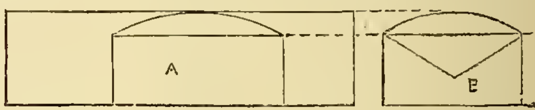


FIG. 26.—PINCUSHION. A, Side View; B, End View.

moulded to the required form. Then take a piece of covering material of sufficient size to cover the sides and top, and of sufficient length to allow of the ends being folded in after the manner that similar packages are usually treated.

Pot Cover (Fig. 27).—One circular or other shaped piece of the size of the aperture to be stopped, glued on to another of larger dimensions. If a handle is required, glue on one or more thicknesses of pasteboard on which to rest the cross-bar.

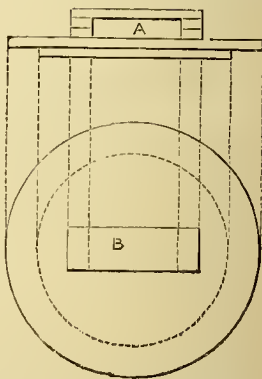


FIG. 27.—POT COVER.
A, Elevation of cover; B, Plan.

Bracket for Washstand, etc. (Fig. 28).—This is made out of a piece of pasteboard cut to the shape of the corner of the piece of furniture to which it is to be attached, and to two edges, A and B, two other pieces, C and D, are to be fixed, so as to be partly above and partly below the piece which is intended for the rest. To keep it in its position, a cylindrical piece, O, is

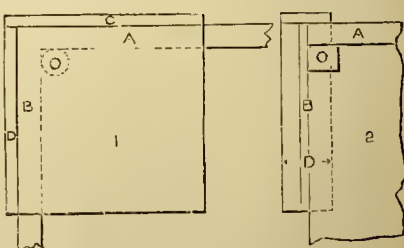


FIG. 28.—BRACKET FOR WASHSTAND, ETC.
1, Plan; 2, Side Elevation.

attached underneath so as nearly to touch the edge of the article on which it is intended to rest.

Razor Strop (Fig. 29).—A capital strop may be

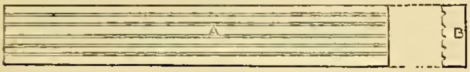


FIG. 29.—RAZOR STROP. A, Plan; B, End View.

made by cutting a series of grooves tolerably close together on the surface of a soft piece of deal or other soft wood. This may readily be done with a fork or pointed instrument, guided by a ruler.

Fender (Fig. 30).—As it is probable that the pasteboard will not be of sufficient length for the fender without joining, cut two pieces of the same length and width, and with both ends square. One end of each piece must then be bent either square or cylindrical, and, if the board is too thick to allow of this being done without its cracking, slightly moisten it about the part to be bent, and allow the moisture a short time to soak in. Then gently and gradually press it round a cylinder of the required diameter, and, if necessary, soak it again,

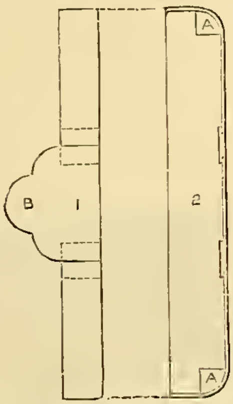


FIG. 30.—FENDER. 1, Elevation; 2, Ground Plan.

FIG. 31.—PENCIL SHARPENER. 1, End View; B, Side View.

and proceed as before till the proper curve is attained. Bend it in its position till dry, and finally fix it to its form with brackets, A A, glued to each lower corner. Then bring the other two ends together, and over the joint glue a slip about an inch wide, or if an ornament B, is required in the centre, cut this out separately, and insert it between the two pieces.

Pencil Sharpener (Fig. 31).—This can be made out of a steel pen, A, fixed into a suitable handle, B, having the under side cut away so as to allow of a longer point being made.

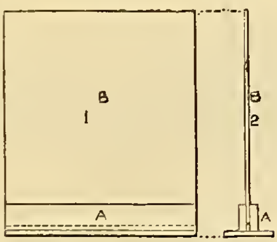


FIG. 32.—COPYING FRAME. 1, Front View; B, Side View.

Copying Frame (Fig. 32).—Make a support, A, for a sheet of glass, B, as shown. Then, if a picture or other object is laid on the table on the left side of the glass, and a sheet of plain paper at an equal distance on the other, by looking through the glass from the left side, the reflection of the object will be seen upon the paper on the other side, and can be traced thereon with a pencil.

Anvil for Tins, etc. (Fig. 33).—A common flat-iron affords an excellent anvil for the manipulation and moulding of tin cans. The illustration will show the method of using it. A is the iron, and B the tin to be moulded. The round point of the iron forms the anvil on which the tin is to be beaten, or against which it may be pressed, in order either to bring it into any particular form that may be desired, or to take out dents, etc., that may have been made in the edge.

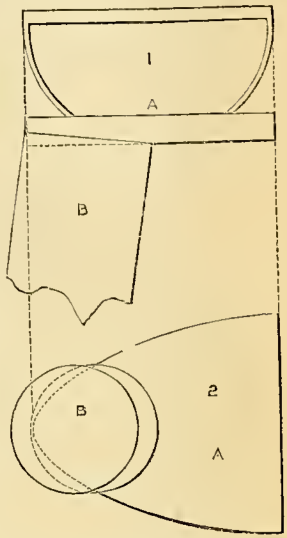


FIG. 33.—IRON AS ANVIL FOR TINS, ETC. 1, Side View; B, Plan.

(*To be continued.*)

PHOTOGRAPHIC APPARATUS: ITS PREPARATION AND CONSTRUCTION.

By JOHN POCOCK.

VI.—DARK TENTS.

ALTHOUGH since the advent of gelatine plates, dark tents have to some extent gone out of use, they are, of course, still necessary for the wet process preferred even now by some, and they are also occasionally used by gelatine workers who prefer to develop some of their plates in the field.

The first tent I shall describe is most suitable for the development of wet plates, as it is so constructed as to be not only self-containing, but also to carry the impedimenta appertaining to that process, while the second tent is more suitable for either changing or developing dry plates.

The first consists of a deal box supported upon a tripod stand, and having attached to it a light framework which supports the tent proper at a convenient height above the head of the operator. This box is made of ½ inch deal, and a side view of it is seen

in Fig. 56; the back and ends should be dovetailed together; the front is hinged to the bottom, and lets down as shown in the figure, being supported in a horizontal position by a chain at each end, a small slip of wood screwed on inside at one or each end turns up to support the lid in the position shown. The outside dimensions of the box are, 2 feet long, $7\frac{1}{4}$ inches broad, and 9 inches high. At each end a rebate is cut in the lid $\frac{3}{4}$ of an inch deep, and extending for $2\frac{1}{2}$ inches from the front, and over this an angle of stout brass is screwed; this leaves two square holes into which the brass framework is to be fitted. Two holes are bored in one end of the box to allow two rods — pieces of stair-rod about 14 inches long are just the thing—to slide through, and two eyes are screwed into the bottom of the box inside, to take the other ends of these rods, which are pulled out, whenever the tent is set up for use in the field, in order to form a support for the water-cistern.

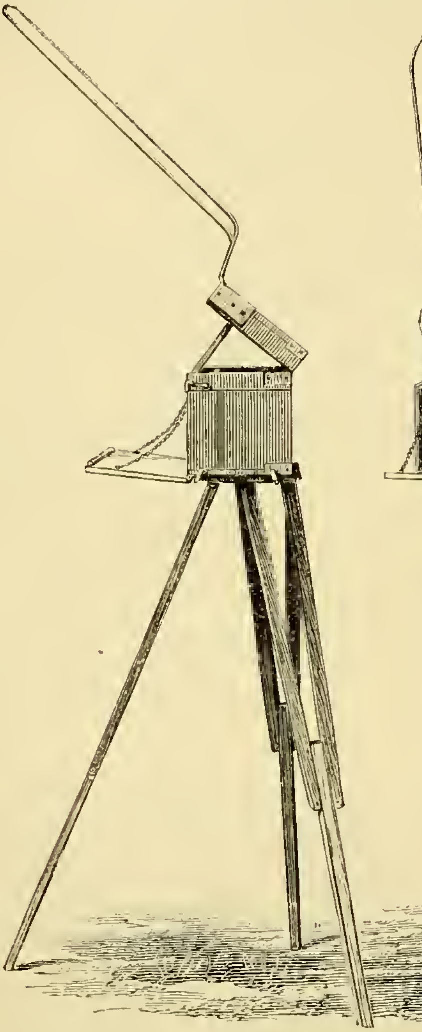


FIG. 56.—BOX FOR DARK TENT, END VIEW.

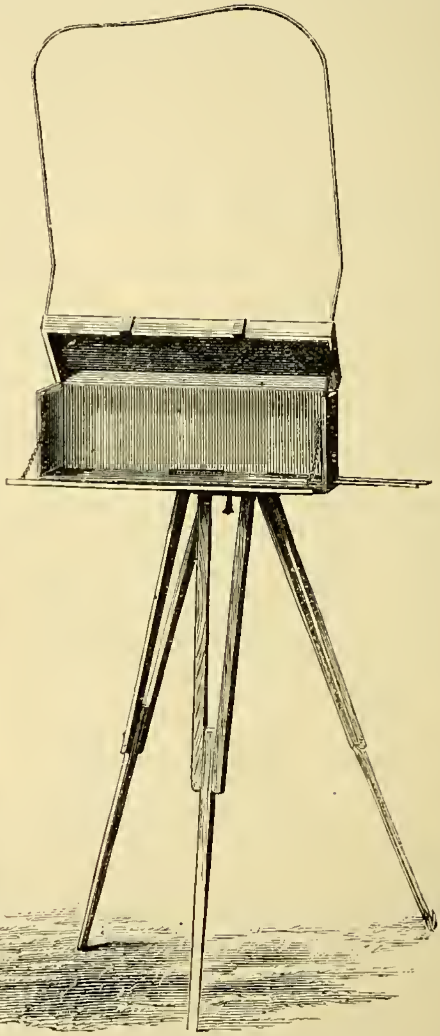


FIG. 57.—FRONT VIEW OF BOX, OPEN.

The box may be either stained or painted outside, and if bound with brass it will add both to its strength and its appearance. Inside it should be painted with two coats of Brunswick black; and thin canvas or some other material of a similar character, dressed with linseed oil and lampblack, should be tacked over the hinged parts to guard from light.

Fig. 57 gives a front view of the box open, and Fig. 58 shows it closed. It will be noticed that the stand is not placed in the centre, but nearer to one end; otherwise when the cistern had been filled with water, the tent would be likely to tip over to that side.

This part being now finished, we will turn our attention to the top framework, the parts of which are made of two pieces of stair-rod and five pieces of brass tubing. These pieces are shown separately in Fig. 59; two pieces of rod, each 8 inches long, are bent to the shape shown by A, the lower ends having been hammered till they are somewhat square, and a piece of tin, zinc, or brass soldered round them so as to increase their size, and make the pieces fit firmly into the angles on the lid of the box. To the other ends of these pieces straight brass tubes each 17 inches long are fitted, as shown by B. To these again are fitted two curved pieces of tubing a size larger than those last described (see C); a straight piece of the same size as the two pieces used for B goes between and joins the curved pieces, and our framework is complete. For packing, this framework takes to pieces, and is secured inside the lid by buttons of either brass or wood.

The covering may be made of one thickness of orange-coloured, and two thicknesses of black lining,

the outer of which should be waterproofed with boiled linseed oil and lampblack, or any other opaque waterproof mixture. This covering must be made to fit the framework; it should come well over the lid and sides of the box and under the front flap, extending down below the waist of the operator when he is inside. A tape should be run round the bottom, so that it may be drawn tight round the waist, or it may be tucked in under the waistcoat. A flap must be cut in the two outer black coverings just above the lid of the box, and a piece of orange-coloured lining inserted, thus making the orange covering double at this part. This is to serve as a window, and the degree of light admitted may be regulated by turning the black flaps more or less back. A nut is let into the bottom of the box, and this with a thumb-screw, similar to those used for fastening door-shutters, secures the tent firmly upon the tripod.

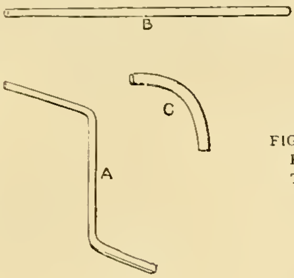


FIG. 59.—PARTS OF TOP FRAMEWORK.

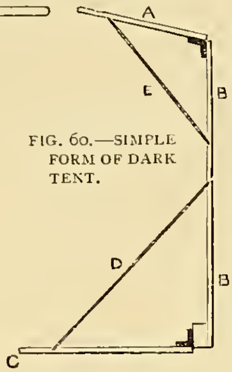


FIG. 60.—SIMPLE FORM OF DARK TENT.

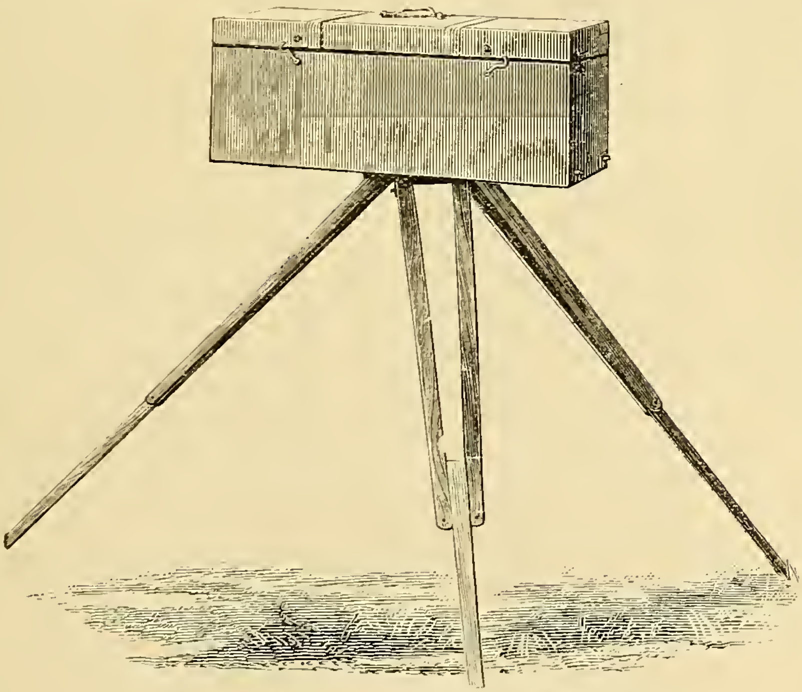


FIG. 58.—FRONT VIEW OF BOX, CLOSED.

The cistern should be made of zinc or tin; if of the latter metal it should be well coated with Brunswick black inside and out. The size should be about 6 by 8 by 7 inches high, but the exact dimensions will depend upon what is to be put into it when it is packed. It will be found to make a very convenient case for camera and dark slides. At the bottom, in the middle of the broad side, a small piece of tube about 1 inch long should be soldered. This piece of tube enters through a small hole in the end of the box, and about 12 or 18 inches of india-rubber tubing are attached to it to carry the water to the plate during the process of developing. No tap is required, the end of the tubing, when not in use, being simply hung over a hook inside the box, and above the level of the water in the cistern.

The sink is made of such a size that it will fit over the top of the cistern as a cover when the latter is packed. When in use, it is placed on the front flap of the box at the right-hand end; a small piece of tubing soldered into one corner goes through the front flap, and the drainage is conducted by an india-rubber tube to the ground.

The other tent is a very simple affair, and is shown in Fig. 60. It consists of three pieces of wood ½ an inch thick, and of a size according to requirements, hinged together with the joints properly protected with light-proof material. A slip, E, is screwed on to each side of B, and when put up these slips prop up the roof, A. Another slip, D, screwed on to C, keeps the back B from falling in; the covering is nailed round the edges and the tent is complete.

To pack it, A is folded inwards upon B, and B is folded inwards upon C; the cover is wrapped round it, and a strap passed round the whole, to make a convenient parcel for carriage.

A piece of ruby glass let into the centre of the back B forms the window. This appliance has the merit of being inexpensive and easily made, and is sufficient for all practical purposes.

(*To be continued.*)

LITHOGRAPHY FOR AMATEURS.

By H. E. GRANTHAM.

IV.—PRINTING.

WHEN the job is to be printed, the stone is placed upon the press, and the gum washed off, the stone damped and rolled up, the paper laid to the guide marks, and a card or other backing laid over the whole surface of the stone to keep it clean; the stone run through, the press pulled back, the backing removed, and lastly the paper. If the sponge is wet enough it will not be necessary to wet the stone *all over* with it at each pull, a dash, say from the left top corner to the opposite corner, will generally give sufficient moisture to keep the damping cloth wet enough to get the whole surface into proper condition for rolling up. A good impression must be quite black but not look "heavy;" be clean, firm, and quite sharp.

The following list shows what defects are most likely to be noticed as the printing proceeds, and in the opposite column I have placed the best remedy:

Defects.	Remedies.
The printed work looks *grey*, yet the lines are all firm.	Put more ink upon the roller.
A part of the work in the direction of the "pull" will not print black.	This is due to the scraper of the press not being true to the surface of the stone. If the scraper is an iron revolving one, nothing can be done, except trying to *tear* a piece of paper to the weak part, and pasting it upon the card backing, so as to make the pressure even. When the job is done, the stone must be carefully rubbed level by the second grit before putting fresh work upon it. If the press is a regular litho' press, with boxwood scraper, take the scraper out of the box, and laying a piece of paper across the stone, and then on the top of it a piece of coarse sand-paper, rub the bottom edge of the scraper upon the paper until it is true.
Patches or streaks of ink are found to get on the stone.	Stone has got too dry, damp over again, and roll lightly, and it will all roll off.
The stone, though properly damped, always catches ink upon some portion of the stone, not a part of the work.	Probably caused by some greasy spot not having been properly cleaned off. Clean off with snake-stone or the scraper as required. Etch the part and continue the printing.
The printing no longer looks sharp, corners clog up, as if the pen had a hair in it when the work was written.	It is generally caused by insufficient damping, or by using too thin ink. Damp over again, and roll it more freely and lightly; if this does not do, try stiffer ink.
The fine strokes get finer and won't print firm.	Either the ink is used too stiff, or the printer "grips" the roller, and perhaps rolls too quickly. Roll freely but rather slowly, with fair pressure on the roller, and make the ink a little thinner.
Lines appear firm on the stone, but won't print black.	Pressure too light. Use more pressure.
Some of the lines appear doubled.	Paper badly laid, lay more carefully.

The foregoing appear to be about all the commoner defects likely to occur in the course of the printing. If the printer has occasion to leave the work for more than a minute, he ought either to wet the stone well, and cover it with the damping cloth, or, what is much better, to gum it over. The stone should always be gummed if left for any length of time, also when the job is finished, but a second edition may be wanted. Of course, where there is only one stone the printer must polish off each job as it is finished. Figs. 3 and 4 in page 396 represent the different methods of holding the paper when laid to a line drawn on the far side of the stone, as in Fig. 3; and when to a line drawn on the right hand side, as in Fig. 4. They are engraved from photographs taken for the express purpose of illustrating these points effectively.

The paper should not as a rule be packed up directly after being printed, but be scattered over a millboard or something of the sort, and be covered over with an old newspaper to keep the dust off, and to give time to dry.

If the stone, *i.e.*, the work upon the stone (printers often speak of the work upon the stone as the "stone") should get much clogged up, the best remedy is to wash it out with turps, by shaking a few drops of

turps from a bottle with a "nick" cut in the cork, upon the stone, and gently rubbing it with a bit of flannel, care being taken to keep the stone wet, until the work has pretty well disappeared from the stone, add a little more water, and continue the rubbing without adding more turps, and the work will gradually come up stronger; damp and roll carefully up until quite firm and strong, then slightly etch over, and the work ought to keep in much better condition. If a tint should get on the work during the rolling up, wash out again, keeping the stone wetter, and not rubbing up so much as before, then roll up; if it should again appear, roll till fairly full, wet the stone, and slightly etch the tint, washing off the acid immediately. The tint ought then to disappear on resuming the rolling up.

Work that has to be put on one side for long should be washed out, rolled well up, and gummed over, when it can be put on one side, standing somewhere out of the way close to a wall. On resuming the printing of such a stone, if it has remained long between the different editions, wash the gum off, wash out with turps, roll up, and continue printing as usual.

A mistake or a broken line may not be discovered until after etching; the best thing, generally, is to touch the part with weak acetic acid, wash well off, dry the part, or the whole of the stone, and put in the required correction with the litho writing ink, treating it as fresh work.

Many prefer to put the design upon the stone direct, instead of employing the transfer process, the chief disadvantage is, that everything has to be reversed in regard to right and left, unless it is a design with both sides alike. The usual practice in working direct on the stone is to make a tracing on transparent tracing paper, which is put face downwards on the stone, and kept in a proper position by a touch of gum along one edge, a piece of *red* tracing paper is then slipped between the stone and the tracing, and the work on the latter is again gone over, using a hard pencil, or some prefer a "tracing point;" on the work being finished, the artist takes up the paper and finds a *red* outline upon the stone, and he proceeds to work it on the stone with the usual ink.

It is generally slower to work direct upon the stone than to use the transfer process; but the work is firmer and stronger, and it enables work to be got perfectly true to scale and square, which owing to the requisite damping of the paper, cannot be relied on being in the ordinary transfer process, on account of the paper stretching when damped.

To Pull Re-transfers from the stone, printing ink with a little tallow can be used, or the "Re-transfer" ink bought of the makers, to which some ordinary litho ink has been added to make it work better. Wash the work out with turps, and carefully roll up with the re-transfer ink; waft the stone dry, and print upon a piece of writing, or other transfer paper. The paper must be carefully peeled off the stone, as the composition on the paper always makes it stick to it more or less, and if pulled off quickly it would very likely tear. The transfers are transferred to stone as described for a writing transfer, except that as they are generally mounted upon a piece of paper, they are damped in the "damping book," which is simply a few sheets of any sort of thick paper, well damped or wetted by being dipped into water; put one on the top of the other, and a weight on the whole, left for a time to allow the damp to soak evenly in, when it is ready for use. If I have only one "patched up" transfer to put on, I often simply damp both sides of a sheet or two of paper, leave a few minutes until they no longer look wet; then place the transfer in between a couple of the sheets and leave till the transfer is damp enough, which it generally is by the time the stone is ready.

(*To be continued.*)

HOW TO CONSTRUCT A SIX-INCH WOODEN LATHE.

By OLLA PODRIDA.

I.—INTRODUCTORY—WORKING DRAWINGS—FRONT ELEVATION—END ELEVATION—PLAN—BED—HEADSTOCK—MATERIALS—CONSTRUCTION OF BED.

(*For Figures* 1—8, *see Folding Sheet issued with this Part.*)

THIS and the papers that will follow are written more expressly for the assistance of those who, while desirous of possessing a lathe of serviceable size, cannot afford the purchase of such complete, or even the necessary castings and other parts in the rough, allowing them competent to fit up the details. There are others, also, who, while able to afford the purchase of the requisite details, do not possess sufficient knowledge of machine fitting to enable them to carry out the construction of a lathe in metal, but I trust that they will, if inclined, be enabled with the assistance of this paper and the accompanying illustrations, to make one, in the construction of which wood may be chiefly employed.

It must be borne in mind that a lathe cannot be built without the assistance of another one; the mandrel at least, must be turned, although with the file an adept might rig up a makeshift, and with its assistance pave the way to the production of a better article. Given the mandrel turned, an amateur might find it a matter of difficulty to overcome the remainder

while, on the other hand, the professional mechanic would simply consider himself "set up," and if a handy man, would readily accomplish the other details without external assistance. Quite recently I was shown a lathe, the fast and loose headstocks of which had been bored out in a most primitive machine, consisting mainly of an old poker converted into a boring bar and worked by hand. The result was certainly most creditable to the maker's ingenuity and perseverance. I mention this instance hoping that it may encourage the diffident, and show that they need not be disheartened when obstacles arise in their path. There is mostly an "easier" way out of a difficulty. If it can't be readily overcome one way, a little thought and consideration will generally discover some other plan more agreeable to the circumstances, or suitable to the appliances at hand.

The construction of a "wooden" lathe will be found to present but little difficulty when compared to its fellow in metal. "Wasters" occurring in the process may be regarded with comparatively little regret. The spoiling of a piece of wood is a far less serious matter than a similar mishap with a casting, seeing that the former can more readily be rep'aced, and at much less cost. A wooden lathe will be found to command a wide field of work. Wood turning in a variety of forms, can be executed with quite as much accuracy and despatch as in an iron one. The possessor of a wooden lathe, such as is under notice, may also successfully cope with metal work, even in comparatively heavy forms of hand turning.

Working drawings, complete in detail, of a 6-inch lathe are given herewith, and it is hoped that by their aid, coupled with the instructions herein, the construction of a cheap but serviceable form of lathe may be accomplished.

We should first obtain a good general idea of the material, construction and relation of the different parts before entering into the details. In every case it will be found of great advantage to first study the arrangement of any contemplated machine or appliance, well mastering the relation of parts, and fixing them in the mind before entering into the construction thereof. When this is neglected, the old adage, "more haste less speed," is frequently brought forcibly to mind. Always look a-head and consider how things are to be done, and what they can be done with. Sometimes the particular form of a detail presents difficulties which the appliances at command cannot meet or successfully cope with. If this is not perceived in the early stages of the design, much time and labour may be thrown away, whereas, if the difficulty had been foreseen, some modification might have been effected, thereby enabling the work to be carried out without the expense of additional tools or special appliances. It will be found of great advantage to spend some time in simplifying difficult or complicated forms. Apart from the interest attached to such scheming, the result will be more satisfactory, and the time thus spent amply recouped by the saving and prevention of future trouble.

Referring to the drawings—Fig. 1 is a front elevation; Fig. 2 an end elevation; and Fig. 3 a plan of the lathe complete, showing it as it should stand when finished. Every part is, I trust, shown clearly, ticked lines being employed to assist comprehension of such details as are hidden by adjacent portions of the design. The above, Figs. 1, 2 and 3, are drawn on a scale of $\frac{1}{8}$ inch full size, or $1\frac{1}{2}$ inch to a foot. The other figures in the Folding Sheet represent alternate forms of fast headstocks. These latter are drawn half size, and will, therefore, be readily comprehended. The latter are given in order that a greater range of choice may be afforded. Each form will be fully treated upon later on, under the section devoted to headstocks.

Returning to the elevations and plan of the lathe complete, we will briefly examine the general construction. The bed consists of two pieces of timber, B, B, bolted firmly to and supported by the uprights C, D, one of which, D, is extended up to form the back part of fast headstock. These uprights, C, D, are tenoned into two pieces of wood, F, F, which form feet. These feet are stayed at the front by means of a strap of hoop iron, S, and at the back by a wooden bar W, to which is hinged the treadle T, which is also framed of wood. The flywheel may preferably be of cast iron, but I have shown it built of wood. The latter form will be found very serviceable. It has three speeds. The crank shaft is carried on centres fixed in the uprights C, D. The crank has a throw of $1\frac{1}{2}$ inches, giving 3 inches stroke. The strain, thrown on the uprights by the adjusting screws carrying the flywheel and crankshaft, is met by the hoop iron strap, S, and the tie W. The "poppit," or loose head, is fashioned out of a single block of wood, and carries a centre pointed screw, which is actuated by a vice handle and secured by lock nuts. The socket for T-rests, as also the T's, are made of cast iron, wood being unsuitable for these parts. Drawings and full instructions, for making the patterns for socket and rests, will be given further on. The mandrel is carried in two bearings—the front one being conical and the back one plain. These bearings, or bushes, are of brass, and secured by screws. The end pressure is taken by a centre pointed tail screw carried in a simple bracket, K, fixed to the back of headstock by means of screws. The mandrel pulley is of wood, speeded to suit the flywheel.

A sectional elevation, half size, of the headstock complete, is given in Fig. 4. Fig. 6 part sectional elevation, and Fig. 5, front elevation, are half size views of an alternative form, simpler in detail. Figs. 7 and 8, also half size, give another alternative form, which, although primitively simple, will, nevertheless, be found very serviceable. The first named, Fig. 4, is the best, but the last-mentioned will be found very satisfactory, and will, with care, last a long time. In fact, speaking for myself, I would prefer Fig. 8 if provided with means of adjustment, as shown in front view, Fig. 7. The endurance of a wooden bearing when kept properly lubricated, is often surprising, and the cheapness will in many cases outweigh the advantages of the stiffer form given in Fig. 4. These headstocks will be treated separately in full detail later on.

select a good quality of oak, that is, supposing the cubic content of the exchequer equal to these timbers. If expense is a consideration, then let me strongly recommend Riga fir of good quality. The latter can be obtained at about one-third the cost of teak or oak, and works up much easier. In any case be assured that the stuff is well and thoroughly seasoned, otherwise "trubble" will ensue.

We will consider material disposed of, and proceed with the construction in detail :—

Bed.—The sides of the bed consist of two pieces of timber, each 5 feet long by 5 inches wide, or deep, and 2 inches thick when finished. We shall require these to be about $5\frac{1}{4}$ inches wide, and $2\frac{1}{2}$ inches thick in the rough, and an inch or so over the finished length to allow for cleaning up.

The sides first must be planed up truly parallel,

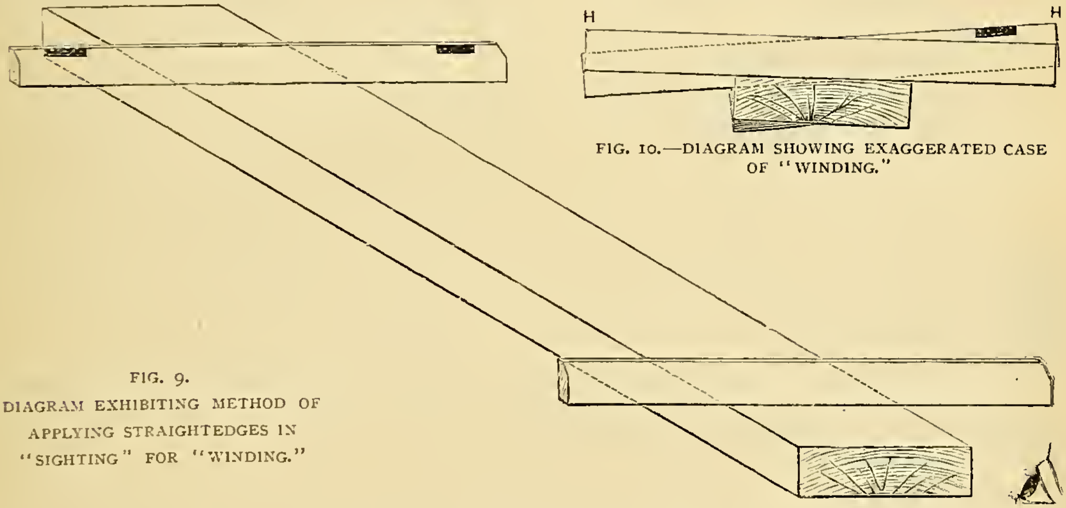


FIG. 10.—DIAGRAM SHOWING EXAGGERATED CASE OF "WINDING."

FIG. 9.
DIAGRAM EXHIBITING METHOD OF APPLYING STRAIGHTEDGES IN "SIGHTING" FOR "WINDING."

Before proceeding in detail, the kind of timber most suitable to purse and purpose should be considered. Teak, oak, pitchpine and fir, may be selected from. The first, I consider to be the most suitable, on account of its superior stiffness and durability, but it is more expensive than the others, and is also liable to split in driving bolts, and in mortising. Oak is also very suitable, but it is difficult to obtain a sound quality when cost is a consideration ; it is less liable to split, but more likely to warp and shrink than teak. Pitchpine is very stiff, and stands well, but is unpleasant to work, especially if very "pitchy." Fir is much better in this respect, and if a good quality can be obtained, it will be found nearly equal to the average class of oak as regards stiffness ; of course, it is not so hard, and therefore more easily indented or abraded.

To sum up :—Use teak if obtainable, if not, then

care being taken to ensure that the surfaces are "in winding," *i.e.*, without twist in any direction. If one side of each piece is thus planed at first, then the other may be gauged from it with accuracy. If the side finished first is untrue, the other will simply be a replica of its untruth.

In checking for "winding," two straightedges are employed in the manner shown in Fig. 9. These straightedges must be truly parallel, about 20 inches long and $\frac{3}{8}$ or $\frac{1}{2}$ inch thick on one edge, so as to have a good base to stand upon. The upper, or "sight" edges are bevelled, as in ordinary straightedges, and, to assist the eye in looking over them, one should have the "sight" edge blackened, as shown in the sketch. The black parts will, of course, face the eye of the user. Fig. 10 gives a view of the straightedges in sighting position as applied to an exaggerated twist, or a piece of work, the face of which is very

much "in winding." Suppose that such a piece had to be dealt with. Then to correct it we must plane down the high parts at H, H, Fig. 10, in doing which the plane will be worked diagonally over the work, guided by frequent applications of the "sighting" gear. That end, which in thickness can best afford it, should be planed *hardest*. The sides finished, the squaring of the edges next occupies our attention. This will best be done by clamping the two pieces together, and squaring two of the edges at one operation. Then gauge for the width, 5 inches, and square the other two edges to the gauge mark. Take care that in shifting and turning the pieces upside down on the work bench, the relation of the edges which have been finished is not altered. We may now put the bed aside and proceed with the framing.

(*To be continued.*)

FISHING TACKLE:

ITS MATERIALS AND MANUFACTURE.

By J. HARRINGTON KEENE.

VIII.—THE FITTINGS OF THE ROD (*continued*)—ROD MAKING AND MENDING.

THE remaining accompaniments for a completely fitted rod are shown in Figs. 93, 94, 95, and 96.

Fig. 93 is a spike or spear, which in the case of a fly-rod, is extremely useful. If an entanglement of the line happens, the rod can instantly be fixed upright by driving the spear in the earth, which is much preferable to laying the rod down, because in the latter case you are so apt to tread on it. When the spear is not in use, a broad-headed screw is turned into the aperture. The spear is of iron, and should not be more pointed than is shown for fear of accidents. I say this because I once was witness of a terrible piece of injury caused by a sharp-pointed spike. The angler slipped on the rocks, and the spear entered his thigh quite two and a half inches, and the result was a permanent lameness. Fig. 94 shows a rubber button which takes the place of the broad-headed screw in a pike rod. Its utility is very great when one is casting a spinning or other bait, from the fact that it does not slip when the end of the butt is placed against the stomach for its *point d'appui*. Fig. 95 represents a ferrule and cap in the place of either, or both of the preceding, when the butt, as is the case with some fly-rods, is hollow to contain one or more spare tops, which device is most convenient for the traveller-angler to whom economy of space is all important.

Fig. 96 is a rough and easily made rod-stop when the worker has not a lathe to turn his stops, as shown in Fig. 95. It is, of course, intended to keep the ferrules from being crushed when travelling. In addition to these materials, silk of several colours for whipping—sewing silk will do—and cobbler's and white wax and varnish are necessary. The composition of the last two articles will be given a little further on.

The tools required by the amateur rod-maker need not be many or expensive; the ordinary carpenter's outfit will furnish most of them. A vice of wood is best, is of paramount necessity. Files and rasps of various degrees of cutting power, several planes, one or two small ones of the Melhuish pattern (page 196) are very useful, as are callipers also (Fig. 97), and a set of brush-maker's drills with centre-bit are indispensable. These latter are for drilling the holes for the admission of the small counters (see B, Fig. 80); and when there is no lathe, I know of no other method which can excel this one. How to do it will be considered presently. Sand-paper of various degrees of fineness, and some broken flint glass of good hard quality, completes the outfit so far as tools, except, indeed, one other invention of my own for driving on the ferrules, which is represented in Fig. 98. It is made of withy, and is used to get the larger ferrules and the large and small counters in their places. If the reader refers back to Fig. 80, he will immediately discern the utility of this simple tool.

I mentioned the desirability of white wax and varnish first. It may be useful if I give the composition of these necessary articles before going further. White wax, or rather a colourless wax, is very useful for application when it is intended to preserve the colour of a green, pink, or other delicate coloured whipping. It is thus made: Take 2 ounces of the best white resin, and $\frac{1}{4}$ ounce of white wax (from the chemist's), simmer them in a pipkin for ten minutes, add $\frac{1}{4}$ of an ounce of tallow, and simmer for a quarter of an hour, then pour the mass into a basin of water, and work it between the fingers till it is perfectly white and pliable. The more you work it the whiter it becomes. The best varnish I know of for rods, and one which gives a high polish, is made from shellac, spirits of wine, and a little gum benzoin. Add about $\frac{1}{2}$ an ounce of the latter to a pint of the shellac varnish, but mind it is pulverised before adding. Coachmaker's varnish is very good over a stain, but I prefer the colour and grain of the wood to show in the rods I make.

The requirements in a good rod may be summed up in three words—strength, pliability, and relative lightness. A good kind of fly-rod for small streams is recommended by Foster in the "Scientific Angler,"

as follows: Three joints or parts, each 3 feet 6 inches in length, the butt to consist of hickory or washaba, the middle joint of best washaba, greenheart, or blue mahoo, the top of snakewood or best jungle cane, the whole being 10 feet 6 inches in length. The ferrule at top of butt should be $\frac{6}{16}$ inch inside, and the one at the top of middle joint $\frac{1}{4}$ inch. The actual weight of a rod of this description is very small.

Fig. 99 shows the butt, ferrules, and three sizes of a fly-rod I constructed very recently, and the procedure of which operation I will presently describe. I desire the reader to carefully study the illustration. It is made entirely of greenheart, excepting the top, which is of jungle cane.

Keeping our attention fixed on the figure, let us make the rod together.

The Butt.—This is of greenheart sawn square with a taper to it. The sawing is done by the timber merchant. We take the piece of wood which is straightest in the grain, and without a twist, and cut it to a 2 feet 6 inch length. With the plane it now becomes necessary to transform it from a square to a round, tapering from the diameter of the butt at A to that at B. After the plane has done its work, you must have recourse to the rasp, ever and anon, raising the butt to your eye to detect any inequalities or faults in its straightness as you glance along it. Various degrees in the roughness of the rasps and files are to be successively used until the butt is round and tapering. Then smooth all with sand-paper, also of successive degrees of roughness, and finally scrape the butt very carefully with broken glass, so as to get a perfectly smooth surface free from dust, for the sand-paper alone always leaves some powder from its own surface, and the wood and the varnish does not take well over it.

You are now ready for the ferrules of the butt, but instead of pausing to fit them, I in my own working invariably go on to prepare the other joints. These are, of course, treated in a precisely similar way, except the top, and their length measurements are as follows: 2nd joint, 2 feet 3 inches; 3rd joint, 2 feet 2 inches; 4th joint, 2 feet $5\frac{1}{2}$ inches; top, 2 feet 4 inches. Of course, the wood is prepared to receive the counters, as shown at C and D, chiefly by aid of the rasps when the operator has not the advantage of a lathe. I, however, find no difficulty. The diameter of the various parts of this rod are as follows at the ferrules inside: 1st ferrule, E, $\frac{1}{2}$ inch; 2nd ferrule, F, $\frac{6}{16}$ inch; 3rd ferrule, $\frac{5}{16}$ inch; 4th ferrule, H, $\frac{3}{16}$ inch; and the top, I, tapering down to about $\frac{1}{16}$ inch. The diameter of the butt end, A, is $1\frac{1}{8}$ inch.

The measurements of Fig. 80, a pike rod, may conveniently be as follows when finished: Butt, 3 feet 3 inches; 2nd joint, 3 feet 3 inches; 3rd joint, 3 feet 3 inches; top, 3 feet; diameter of butt, $1\frac{1}{8}$ inch; diameter of 1st ferrule, inside, $\frac{9}{16}$ inch; diameter of 3rd ferrule, inside, $\frac{5}{16}$ inch. The counters are, of course, made to fit the ferrules.

The next job is to fit the ferrules, and I cannot be too emphatic in enjoining the greatest nicety and care. Do not hurry, whatever you do, and see that the fitting is true in every particular.

Let us begin with the first ferrule, at E. Do not cut away the wood to enable you to fix the ferrule flush with it, for by so doing you weaken your joint. In place of doing so, let the ferrule stand out on the wood. Having shaved and scraped your joint end till it is approximately small enough for the ferrule, put that part of the business on one side for a little time, and attend to another matter—namely, the boring to admit the counter, C, Fig. 99, into the joint end, as shown by the dotted lines in Fig. 80.

To do this take a piece of waxed string, and tightly bind it round the end of the joint, finishing off with a half hitch. Place the joint in the vice, and select the smallest size brushmaker's drill, and bore into the centre of the wood just so far as the small counter is long, measuring by your drill as you proceed. Having bored with the same drill, take it from your centre-bit, and substitute a next size, and so on till you have got the right one. Now having prepared the wood for C and D, put D on in this way: Wind round the wood a thread of waxed silk several times in a wide helix, and fixing the joint in your vice—having previously provided that the ferrule will go on with a little force—drive the ferrule on with the tool shown at Fig. 98, by resting it on the ferrule and striking it with the hammer. If you cannot quite get the ferrule home, hold it over a gas jet for a second or two. The heat will melt the wax on the thread, and a blow or two more on the ferrule's top completes the business. C is to be served in a precisely similar way; and if it be desired, a little bolt can be let through into the wood, and filed off flush to render additional security.

Now to return to B and E. Having fixed the counter, you can see if the small one, C, fits the boring. It should do so quite easily but truly, not too easily, or the joint will rattle when the rod is in use, and not too tightly, or when the joint is wet there will be difficulty in getting them apart. Of course, the counter should go right in to the shoulder.

If this is quite satisfactory, the ferrule, E, may be put on in the manner first described. It should go on to the wood just so far as the diagram indicates by its relation to the counters above. The dotted lines in Figs. 99 and 80 will show what I mean. The same course is taken with each joint. The winch fittings are put on in a precisely similar way.

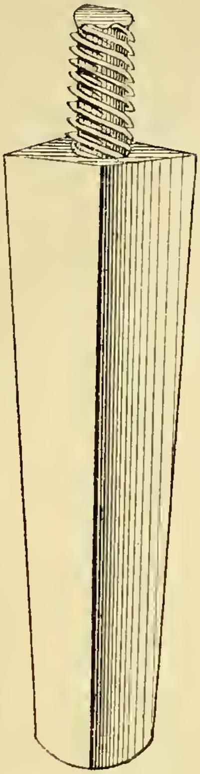


FIG. 93.—TERMINAL ROD SPEAR.

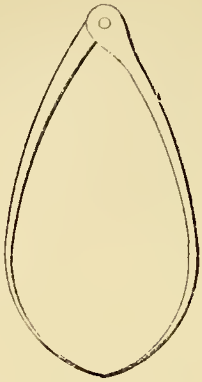


FIG. 97.—CALLIPERS.

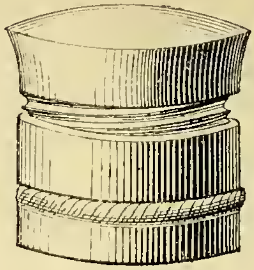


FIG. 95.—END FERRULE.

FIG. 94.—TERMINAL RUBBER BUTTON FOR PIKE ROD.

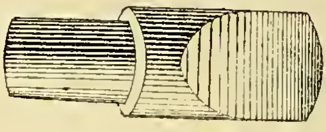


FIG. 96.—WOODEN STOP FOR END OF FERRULE.

FIG. 100.—ROD LOOP.

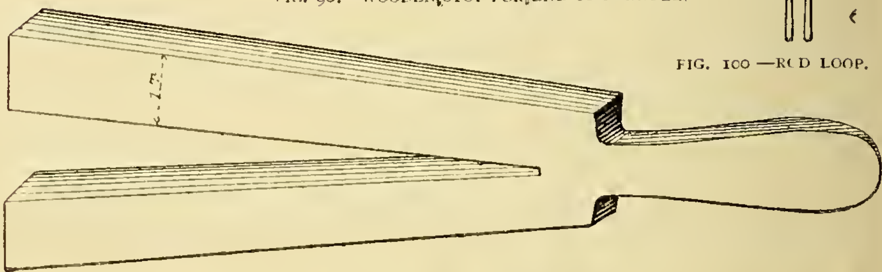


FIG. 98.—TOOL FOR FIXING FERRULES.

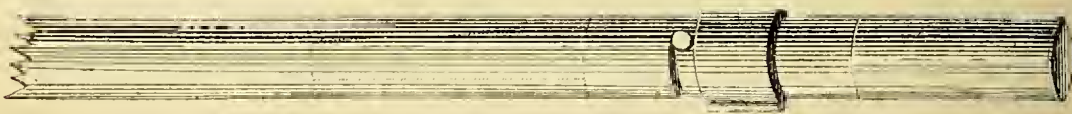


FIG. 101.—LOCK-FAST JOINT.

FIG. 102.—CANE HANDLE FOR ROD.

FIG. 103.—SPLICE OF THE CASTLE CONNELL ROD.

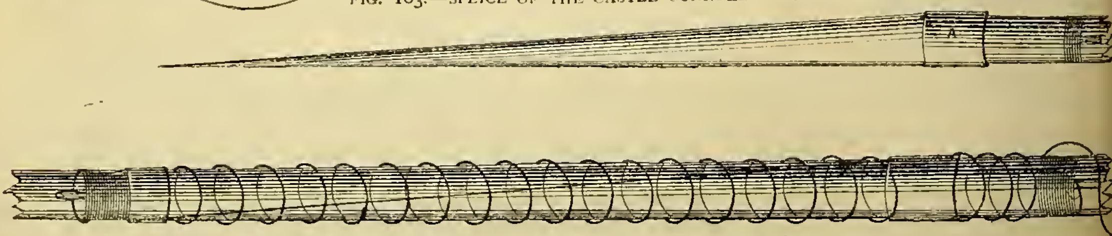


FIG. 104.—THE CASTLE CONNELL ROD SPLICED.

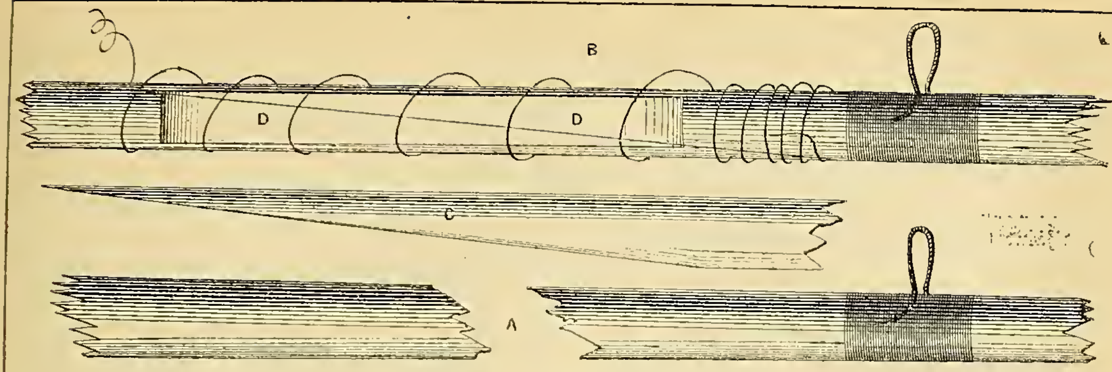


FIG. 105.—HOW TO MEND BROKEN ROD.

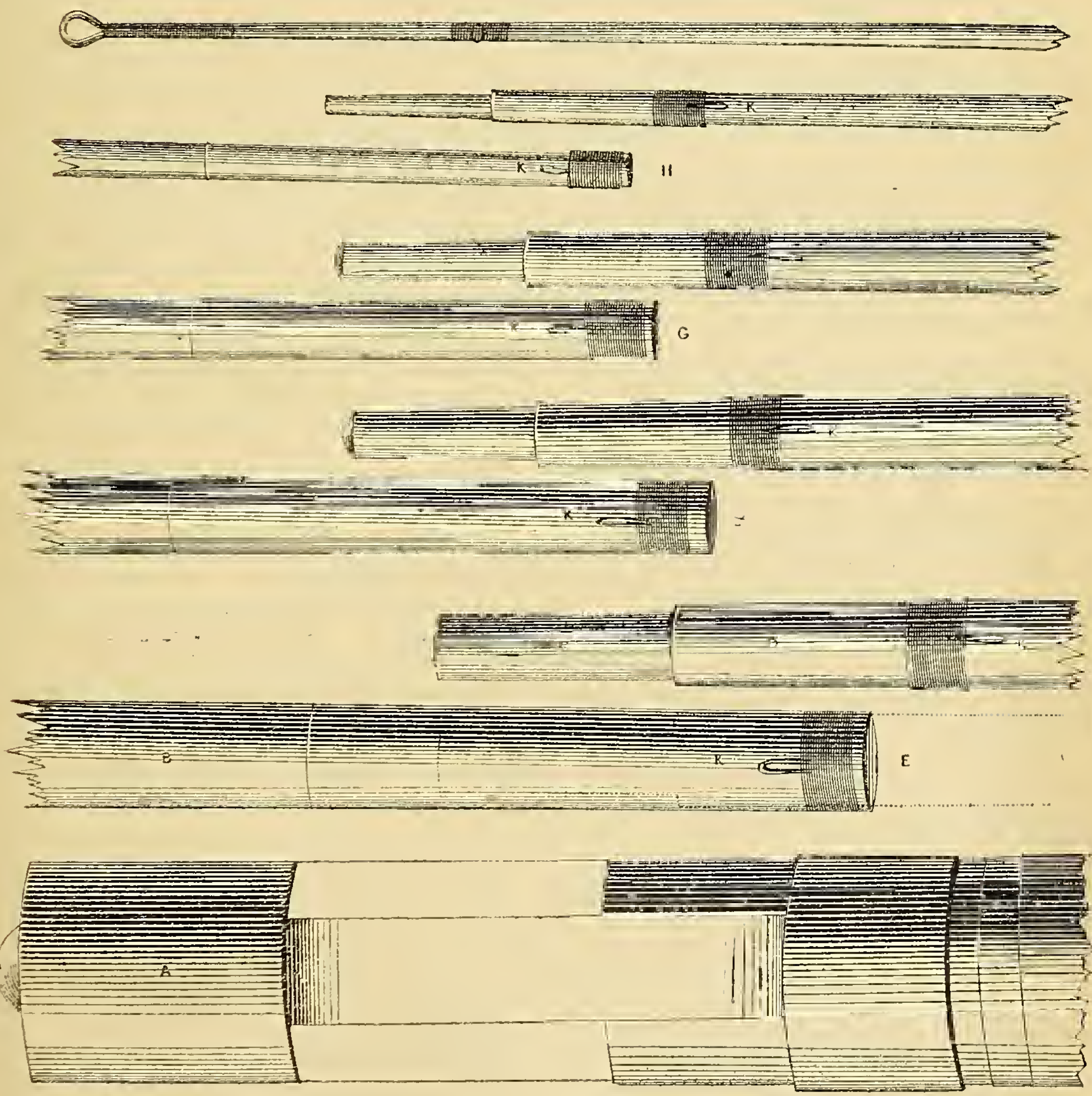


FIG. 99.—FERRULES AND COUNTERS OF FLY ROD.

The next thing to do is the whipping on of the loops, K, K, K, etc. These are simply brass loops of wire (see Fig. 100) fastened at the extremities. The top of the rod may be of greenheart or cane.

For a rod such as I have endeavoured to describe, the rings—of the pattern shown at Fig. 90—are twelve in number, and are thus disposed on the rod:

1st joint (butt) 1 ring: 2 feet from end of butt, size No. 12.

2nd joint 2 rings: 1st, 1 foot from larger end; 2nd, ditto, sizes No. 8.

3rd joint 2 rings: 1 foot apart; top one just below the ferrule.

4th joint 3 rings: 1st, 10 inches; 2nd, 9 inches; 3rd, 8 inches.

Top 4 rings, besides top ring: 1st, 5 inches; 2nd, 7 inches; 3rd, 6 inches; 4th, 5 inches; and top ring 3 inches from the last round ring.

The places for the rings on the pike rod, Fig. 80, are as follows:—

1st joint 1 ring: 2 feet 6 inches from end of butt.

2nd joint 2 rings: 1st, 16 inches from counters; 2nd, 19 inches just behind ferrule.

3rd joint 3 rings: 1st, $12\frac{1}{2}$ inches; 2nd, $12\frac{1}{2}$ inches from last; 3rd, 10 inches from the last.

Top joint 4 rings, besides top ring: 1st, 9 inches from end of counter; 2nd, $9\frac{1}{2}$ inches from last; 3rd, 7 inches from last; 4th, 5 inches from last; top ring, 5 inches from last.

In binding the rings the silk should be very evenly laid on, and fastened off with two half hitches. The varnish before referred to is the best, and should be put on with a camel's-hair brush quite half a dozen times—thinly each time. The top ring is whipped first with fine copper wire for a distance of half an inch, and then with silk.

The polishing of the entire rod now demands a word or two. Having got the wood as smooth as you can make it with scraping, take a piece of coarse flannel and spend an hour in rubbing each joint till the friction has imparted a perfectly smooth surface. Then make a pad of cotton wool and thin calico, and apply the varnish as French polishers do with even and careful strokes. Plenty of patience is required, but the result will surpass your expectations.

One thing I forgot to mention. Before fixing your ferrules (if they are not bronzed by the maker) bronze them yourself with a solution of bichloride of platinum—one part to ten of water. Usually, however, the makers bronze them ready for use.

Though the joints I have recommended are those in regular use, there is a patent lock joint made by Messrs. Allcock, as shown at Fig. 101, which is simply the ordinary bayonet fastening adapted for the purpose. These fittings can be obtained from Mr. Currell, of 6, *Jewry Street*, *Winchester*, with the other materials.

It has been found that the ordinary hardwood butt of a rod is prone to blister the hands when fly-fishing, and to obviate this, various devices have been resorted to. The best of all is that figured in Fig. 102 at A. It consists of fine cane bark wrapped round the butt very closely. It gives a firm grip, and from its varied corrugated surface relieves, and changes, and distributes the pressure. My hands are exceptionally liable to blister, and I always suffered greatly till I resorted to this device, so, therefore, I can recommend it from experience. Leather is very good also, and I have used a piece of india-rubber tubing slipped on the butt with distinct advantage.

One kind of easily made fly-rod must not be forgotten. There are no ferrules to it except those which secure the winch, and if the Hardy's patent winch fittings are employed, no ferrules of any kind are needed. I allude to the Castle Connell spliced rod.

This rod is in two pieces of greenheart, and when it is desired to put it together for fishing, it is only necessary to place the two sections of the splice shown at Fig. 103, and whip them in wide coils, as Fig. 104. I said there need be no ferrules, nor need there, but two are sometimes added at A A, Fig. 103, in which to place the thin ends of the sections, while the splicing is going on. This is a most useful rod, and the principle is applicable to any and all rods.

A word or two in conclusion about mending a rod when broken. Of course, if a man can make a rod he can mend one. However, there are those who will not care to make one, and may yet want to mend one if broken, and for such I offer Fig. 105. Let A represent the fracture, B will exhibit the method of mending. The sections must be cut like C, and be careful that they are slightly *bellied* as there shown, and not with perfectly flat surfaces; and having fitted them together lay on a strip of quill (shown at D) on each side. Then whip with fine silk well waxed closely and very evenly. This looks a simple matter, but considerable care is necessary, and everything depends on your exactitude and neatness.

(*To be continued.*)

HANDY WORK IN FARM AND GARDEN.

By GEORGE EDWINSON.

VII.—ROADS, PATHS, AND PAVEMENTS.

THE character and prosperity of a farmer or gardener will be indicated by the condition of his holding, and the first signs which attract a stranger's notice will be shown on fences, gates, and roads. If the fences are badly constructed, broken,

and ill-kept, the gates in a tumble-down condition, and the roads cut up into deep ruts, filled with water and mire, we may conclude that the farm or garden itself is badly managed, and is unprofitable to the occupier. I have already indicated clearly that a farmer's interests are well served when fences and gates are properly constructed and kept in good repair. The land available for cultivation is increased when fences are properly constructed; growing crops are protected from ravages by straying cattle when fences and gates are kept in good repair; and much valuable time is also saved by a little labour and forethought expended on such matters. The same remarks may be applied to the condition of farm roads and garden paths. Farm roads are frequently found to be in a condition only fitly described by the word disgraceful. In some of the western counties of England the only way to a farm from the main road is through a narrow crooked lane bounded by high turf hedges, which shut out the wind and sun in winter, and tear the corn and hay from passing harvest waggons in summer. As the lane is only wide enough to allow a cart or waggon to pass along it, only one track is possible for wheeled vehicles, and the wheels soon wear deep ruts for themselves. These ruts vary in depth with the condition of the soil, and are filled with mire and water in winter time. The horse track is also uneven, and the low parts are filled with mud and water. Just before harvest time the occupier will send out a man or two with picks to dig in the sides of the ruts, and this is all the repairs ever done to the road. I am not able to estimate the annual cost of wear and tear to wheeled vehicles and horses passing to and fro such a lane, but am certain that it must exceed that of any reasonable outlay to keep the road in thorough repair; and I am surprised that such shrewd men as our English farmers do not see the manifest advantages of a good hard road over that of a rutty, muddy, narrow lane.

If the lane must be narrow because space cannot be allowed for a wider road, then it is a serious mistake to have a narrow road shut in between high hedges. It may be very nice to have a sheltered lane wherein to grow primroses and violets, but these do not pay for such cultivation; and I should recommend that the high banks be levelled with the soil of the adjacent fields, the lane thus made wider, and the road thrown open to the full influences of wind and sun. When a lane is shut in between high hedges or walls, it is never dry in winter time unless its gradient is steep and it is well drained; but when the hedges are low, the surface of the roadway is frequently hardened by the sun and drying winds.

Many of our old farm roads are not only badly constructed, but also badly planned. Their crookedness is proverbial, and one cannot understand why they twist and turn, first to left and then to right, as they wind their sinuous way along from farm to farm, or from these to the highway. They do not turn to avoid rising ground or to skirt the curve of a brook, for they frequently climb unnecessarily every obstacle, or plunge into every little stream running athwart their course. These remarks do not apply exclusively to any English district, but describe certain well-known features in the east as well as the west of England, and show the necessity for reform in farm roads.

As there are signs of a desire for such reforms, I will herewith give a few explanations of the principles to be observed in the construction of new roads. Roads to and from a farm-house should cross the farm in a direction with the line of most probable traffic from the main highway to the arable ground on the farm, and also with a view to place the farm in easy communication with neighbours. At the same time the gradient of the road should receive consideration, and it will be better to make a slight detour of a knoll than to go over it and have a steep gradient in the road. It has been calculated that a rise in gradient increases the cost of drawing a load as follows: Taking the cost of drawing one ton one mile on a level road at 1s., a rise in gradient of 1 in 500 will increase the cost of draught $\frac{1}{2}$d.; 1 in 100, 2d.; 1 in 80, $2\frac{1}{2}$d.; 1 in 60, $3\frac{1}{4}$d.; 1 in 40, $4\frac{1}{2}$d.; 1 in 30, $6\frac{1}{2}$d.; 1 in 20, $10\frac{1}{2}$d.; 1 in 15, 1s. $4\frac{1}{2}$d.; and 1 in 10, 3s. 6d. per ton per mile. The gradient should never exceed 1 in 30; indeed, when the gradient is 1 in 35, it is necessary to put on the brake or drag when descending a hill, and this always means loss of time and material. If a steep gradient cannot be avoided in any other way, the road-maker should resort to excavation, taking out the soil and stones from the high parts, and filling up low parts further along the track. The plant necessary for construction of farm roads is very simple and low in cost. It will consist of one or two wheelbarrows, a few planks, one or two picks, a few shovels, and a crowbar to loosen any large stones that may come in the way. The wheelbarrows should be of the type used by navvies, because such barrows run light on plank roads, and will stand rough usage. They cost from 12s. to 14s. each. Planks will soon repay their first cost in the economy of labour effected by them. The cost will be about 3s. 6d. per plank. Men can do more work in less time on a plank road than can be done by them on a beaten track on the soil itself. The shovels should be round-pointed, with short handles fitted with a cross-piece for the hand. These will cost from 2s. to 2s. 6d. each. They are superior to the square-pointed shovels for the purpose of road-making, since they

enter freely a mass of loose stones and similar rubbish. Not less than three men should be employed together on one section of the road. One of these should break the ground, one fill the barrows, and one run the barrows. If there is much good soil to be removed, and it is wanted elsewhere to thicken or enrich impoverished ground, it will be advisable to employ horses and carts instead of barrows, and fill the soil direct into the carts. Good soil should never be buried under a road. If it is not wanted for present use, it should be thrown up into banks on each side of the road, and carted away as required.

Having decided on the route to be taken by our farm road, and the plant employed in its construction, we must next survey and mark out the route. The roadway should be wide enough to allow two waggons loaded with corn to pass abreast without brushing each other or running one of the wheels in the water channel. Beside this, we must allow 3 feet for fences and water channels, and should therefore mark out the road at a uniform width of 18 feet. The track should be outlined by stakes 18 inches long, driven into the ground on each side at distances of twelve paces apart. When curves are to be made in the road, it should be distinctly understood that the extreme bend of the curve should be marked by a stake driven into the ground at that point and painted red. The gradient is indicated by cross pieces of wood nailed to the tops of the stakes at the required angle.

No hard and fast rule can be given for the removal of the top soil, although, from 18 inches to 2 feet is generally deemed a sufficient depth ; but this must be determined by the character of the soil. The bed of the road must be uniformly level, and, therefore, a greater depth of soil must be taken out from the highest side of a slope, and also from elevated parts of the track. The extra soil thus taken out, will be deposited on lower ground to raise it to the required level. All stones should be picked out by hand, and thrown on one side to help swell the quantity of road material. If marshy, or other soft ground is met with, it will be necessary to drain the ground before attempting to make the road, and the worst spots should be stopped with brushwood or underwood laid in the mire across the track to a depth of 18 inches. On this should be thrown the roughest rubbish selected to form the first layer, and this will then form a good foundation. The future condition of a road is frequently determined by the nature of the first layer put upon its bed. The best consists of large stones from 4 to 6 inches, placed close together by hand. Next to these come broken overburnt bricks, broken furnace slag and clinkers. The worst material for a substratum is that of loose round pebbles, friable stone, and ashes. The second layer should be of well-screened gravel made to fill up all inequalities in the substratum. Over this should be spread a four or five-inch layer of broken stone or pebbles. The amateur road-maker should here be warned by the experience of professionals, and never attempt to metal a road with whole pebbles. These may be used as a second layer, but the top layer must be of broken stone, or angular fragments of such stones as blue granite, trap rock, limestone, ragstone, flint, or quartz. The stone should be broken by hand, and the largest fragments must be small enough to pass through a 2-inch iron ring. On well-kept farms, a various collection of stones is obtainable from hay fields and cornfields, by employing boys and women to hand-pick the fields in spring time. The stones are collected in small strong wicker baskets, and carried to small heaps, which are afterwards carted to larger heaps on waste ground. Land thus freed from surface stones, does not injure scythes and the knives of harvesting machines, and the stones are valuable for road-making and for mending roads. Such heaps of stones will also furnish winter employment for men and boys, who may be set to turn them over, and break all the large stones and pebbles. Stone-breakers' hammers are made of the special form shown in Figs. 81 and 82. The smaller hand hammers are from one to two pounds in weight, and are mounted on long tough ash handles, as shown. The larger hammers or stone sledges for breaking the largest blocks of stone, weigh 7 lbs. each. Ragstone, and limestone, and stones having a similar cleavage grain, are best broken with the form of sledge shown at Fig. 83. A cubical form of fragment should be always sought to be obtained, and as few splinters made as possible. Professional stone-breakers wear wire goggles over their eyes, or wire masks to protect their faces, and they also protect their hands with canvas mittens when breaking flint and similar stones. When the top layer is being laid on a new road, see to it that the middle of the road is raised some 7 or 8 inches above the level of the sides. Over this top layer should be sprinkled a light covering of sand, fine shingle, or road sweepings ; and if this can be watered and rolled with a heavy roller, until a smooth surface has been obtained, the perfection of a macadamised road will be secured.

Quick-set hedges of thorn or privet, or these intermixed with dwarf beech, and protected with a rail fence, will make excellent fences for farm roads, and are superior to high banks of turf or stone. If the gradients of the road are steep, and the district subject to heavy storms of rain, it will be advisable to construct water channels of pitched stone by the sides of the road, and also to lead off the storm water

by frequent side channels into the fields. These channels should be frequently examined and cleaned out, and in all cases the channels by the side of the road should be kept clear of rubbish. When roads show signs of wear, and exhibit sundry pits and small ruts here and there, the faulty spots should be repaired in the following manner :—Score the faulty part with furrows made with the point of a pick, and thus break up the road surface. Over this spread a layer of broken stones, and sprinkle over the top of the stones a thin layer of road scrapings, wet these and beat down hard with a log of wood, or roll the spot with a heavy roller, as in the case of a new road.

layer should be of sifted gravel and sand only, well rolled down, or of limestone chippings of uniform size—that is to say, having the large chips carefully picked out or broken into smaller pieces.

In small gardens, and in farm yards, it is advisable to lay down paths with smooth hard surfaces capable of being swept and washed. They must therefore be something like pavements, and will need a special method of preparation, since only hard wear will render ordinary gravel paths sufficiently smooth. The varieties of such paths usually met with may be classed as follows : concrete, limeash, tar paving, asphalte, flag and stone paving. The preparation for all these should be in the first place similar to that for ordinary gravel paths ; then finish as directed.

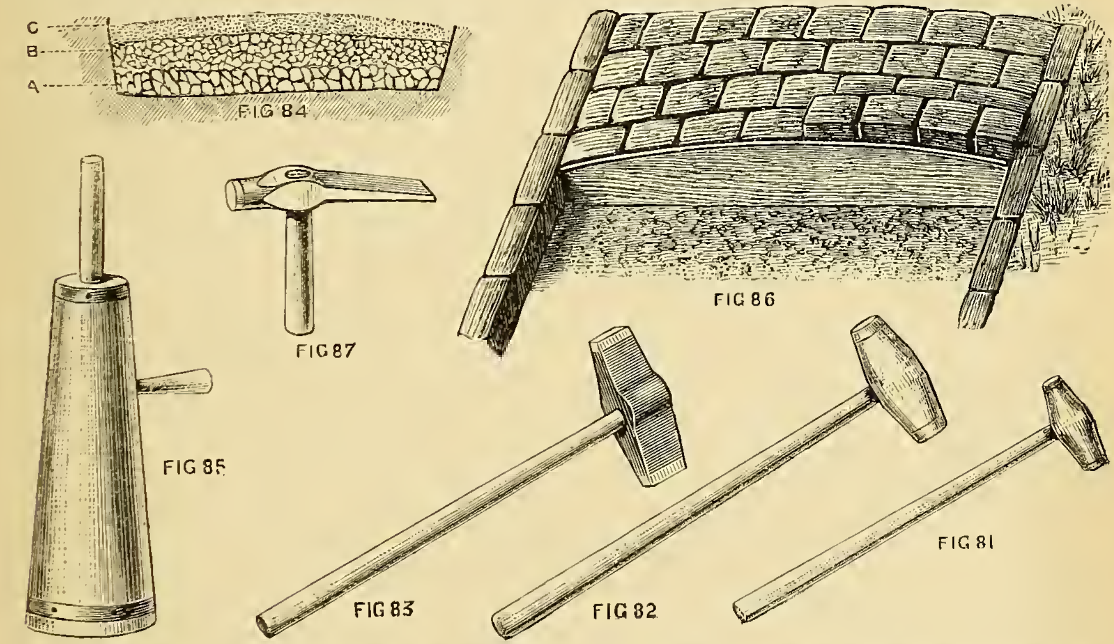


FIG. 81.—STONE-BREAKER'S HAND HAMMER. FIG. 82.—SLEDGE. FIG. 83.—HEAVY SLICING SLEDGE. FIG. 84.—SECTION OF PATH. A, Substratum of Rough Stone ; B, Coarse Gravel or Concrete ; C, Fine Gravel, Sand, or Asphalte. FIG. 85.—PAVIOR'S RAMMER. FIG. 86.—CUBE STONE PAVING. FIG. 87.—PAVIOR'S HAMMER.

Garden Paths.—Footpaths across or by the side of fields and gardens, may be regarded as narrow roads, and should receive similar treatment in their formation when intended to remain as permanent footways. Too often this is neglected on farms, and also on gardens, where the paths are merely a beaten track on the soil trodden hard by the feet of passengers. In wet weather these paths are muddy and slippery. Permanent paths should be properly marked out, the top soil removed, and a substratum of rough stones or clinkers laid down. On this should be spread a layer of small angular stones, shingle, gravel, or pebbles mixed with sand ; this layer must be from 4 to 6 inches higher in the middle of the path than at the sides (see Fig. 84). The top

Concrete Paths.—These are built with concrete laid on the substratum of the path in a layer 4 inches thick, and then coated with a thin layer of cement and sand rendered smooth and hard. The concrete should be made with washed and sifted river gravel, shingle, or stone chippings mixed with Portland cement in the proportion of one bushel of cement to one square yard of gravel. It is most important that the gravel should be free from mud and dust, should be of nearly uniform size, and composed of angular or cubical fragments. Pebbles will not make good concrete, because they do not present a good surface

to each other, and as a consequence, do not bind together. They may be used with small shingle well mixed together, but are then inferior to gravel. The gravel should be laid up by the side of the path in heaps, containing one square yard in each heap, Over each heap should be spread one bushel of cement, and the whole well mixed together. Water must then be poured on the mass and the whole well turned over with shovels until it presents the appearance of a mass of thin mud and stones. This must be spread on the road at once before the cement sets, for it must set only when placed in position. Each shovelful should be flung hard into its place and beaten down hard with the back of the shovels at once. The work will demand some energy, and is best undertaken by two strong men. The finishing coat should be of clean sand two parts, cement one part, mixed on a board in small quantities and spread firmly and smoothly over the surface of the path whilst it is damp, in a layer from 1 to 2 inches in thickness. This work should be done in damp weather, or when skies are clouded, not during heavy rain, nor when the sunshine is hot enough to dry the cement before it sets. It must not be done when frost is imminent, for if the cement gets frozen ever so little, the surface will break up in mild wet weather. Care must be taken not to tread on the cement until it has set hard. To avoid ragged edges by the sides of the path it will be advisable to outline the path with strips of thin wood, or to pitch a kerb of thin stone on each side whilst the concrete is being laid. I have seen some excellent paths made in this way, and if properly made they will last a lifetime of wear.

Lime Ash Paths.—These are made with a concrete of lime and ashes beaten down hard and faced with the finer particles of the concrete. Any well-burnt lime ground to powder will do for the purpose, but the ashes must be coal ashes. These may be mixed with burnt earth or burnt clay, or with fragments of brick if such material is to hand. The substratum may be of stone, or it may be of broken slag or clinkers. The process of preparation and the quantities of materials are the same as for concrete paths. With these materials some really good paths can be made out of the debris of blast furnaces, smelting works, and similar industries. Floors of cellars and of basements can be thus prepared, and floors of this material are not unknown in country cottages.

Tar Paving.—The preparation and substratum should be as for ordinary paths. Over this is sometimes placed a thin layer of concrete. The top layer is composed of stones boiled in coal tar. To prepare the material, screen or sift broken stones, *i.e.*, road metal, or shingle, or river gravel into three grades: fine sand, medium gravel, and large stones. Build a fire with brushwood on some hard ground, and place thereon a quantity of the rough stones in a layer thin enough to allow the fire to burn up between the stones. When these are hot, pour on a quantity of coal tar, and then spread over the blazing mass another layer of stones, then another coat of tar, and another layer of stones, until all the material has been used. Prevent the boiling tar from escaping at the sides of the heap by placing gravel around it, and, when all the rough stones have been used, and are deemed to be well soaked in tar, spread the rest of the gravel over the heap, and mix all well together by turning it over with shovels. The tarry mass thus prepared, must be spread on the foundation of the path in an even layer of from 4 inches to 5 inches in thickness. Over this should be spread a thin layer of the fine sand sifted out, and the whole must be then well rolled with a heavy roller, or beaten down hard with shovels, sprinkling fine sand over the surface as the tar exudes from the stones and stains the sand, and wetting the roller to keep the tar from sticking. The sides of the path should be defined by a kerbing of thin stone or wood. The work should be done in mild dry weather, and iron barrows or iron pails should be used instead of wooden vessels to carry the tarry stones from the heap to the path. The cost will be from 2s. to 2s. 6d. per square yard. The work is necessarily dirty, but paths thus made are impervious to wet, and most suitable along shady places under trees in damp situations.

Asphalte Paving.—This is a most excellent paving, and is most suitable to gentlemen's grounds. It is costly because of the price of the material and the special plant and skill necessary to successfully lay it. The foundation is the same as for concrete paving, including a thin layer of concrete confined by kerbing at the sides. The lumps of asphalte are boiled in an iron cauldron until it becomes like melted pitch, the seething mass is dipped from the cauldron with sand-lined iron pails, and carried quickly to its position on the path, over which it is spread, whilst plastic, in a thin layer, with wooden tools shaped like a plasterer's trowel. It soon sets hard and smooth.

Flag and Stone Paving.—Where large masses of stone are obtainable, or large quantities of pebbles, stone pavements supersede all others, because of the abundance of material close at hand. I do not think, however, that such pavements have any merit in themselves, either as to cost of laying, comfort in their use, or durability. Some skill is needed on the part of the pavior to properly lay down a stone pavement, the stones wear unevenly or sink down into the soil, and the way is always hard, cold, often slippery, and intolerably noisy with a small traffic. As, however, the handy man may have to make or repair such pavements he should know how to do so. The top

soil is to be removed as for ordinary paths, and a layer of gravel is laid down to form a foundation, on this is spread a bed of sifted soil or of sand, and this is to be rammed down hard and level if the stones to be laid thereon are uniform in size and thickness, and in any case must be made hard and firm. This is done with a pavior's rammer, a heavy billet of wood furnished with two handles, as shown, Fig. 85, the long upright handle is grasped with the left hand, and serves to guide the stroke whilst the right hand is employed in lifting the tool by means of the side handle. When the bottom of the trench has been made firm and level, its sides should be pitched with a stone kerb to the required height of the pavement, and each stone should be fixed firmly in the soil to a line determined by the use of a straightedge or an A plummet, and also a stretched line. Flag stones will have to be simply laid on the prepared surface edge to edge, and fitted to the kerb stones. They must be packed up to the required height where necessary with more sand or soil, and gently rammed level. Pebbles, cubes, and similar blocks of paving stones, must be set in the soil in line with the kerb or in transverse line across, and fitted to each other according to size, then rammed down firm to the uniform height of a wooden pattern placed across the face of the work, as shown, Fig. 86. Courtyards are sometimes paved with pebbles in diamond, serrated, herring-bone, and other fanciful patterns. When cubes of artificial stone, or paving bricks are used, the work of laying is much simplified. In laying pavements, be sure to make provision for drainage. A pavement should not be level, but should be highest in the middle, sloping slightly to the water channels. If the court is large, drains must be laid beneath the pavement to take off rain water, and gullies must be made at frequent intervals with the water channels, the mouths of these gullies must be protected with gratings. After a pavement of pebbles or cubes has been laid, the surface should be covered with fine sand or sifted soil, and this should be swept to and fro with a broom until every chink has been filled up. The pavement should then be flooded with water, again covered with sand, and swept a second time. Blocks of wood, 6 in. by 4 by $2\frac{1}{2}$, pickled in tar or creosote, and set with the ends of the grain uppermost, are used in some districts, and make excellent pavements.

In parts of the country where clay is abundant and the soil is wet, some good paths can be formed out of clay ballast burnt hard and made up into concrete with lime or cement. In fact, concrete for paths may be always improved by a mixture of burnt clay ballast with the stones. I have not space in this article to describe the process of preparing this ballast, but hope to do so at some future time.

HANGING SHELVES WITH BEVELLED PLATE GLASS PANELS.

By PITCHPINE.

THIS forms a useful ornament for filling up a blank wall space, and is highly effective without entailing much trouble in its construction. It will be noticed that there is no carved work, which so often proves a stumbling block to the amateur, but it is all plain straightforward work, requiring only accuracy of measurement and careful working to make a successful job of it. The panels should be filled with mirrors of best British plate, and should have bevelled edges. As a rule, I dislike the use of mirrors in the ornamentation of furniture. It often appears so completely out of place; as, for instance, when used, as it occasionally is, for the back of a sideboard, where it is not only of no use, but gives one the idea that it was put there to be broken. There are, however, exceptions to all rules, and in this case I must admit that it looks well, and it also serves the purpose of showing up the ornaments placed upon the shelves.

The three small panels which back the bottom shelf are intended to be filled in with panels of painted wood ; but if you cannot manage the painting yourself, and friends are not available, many other things may be used for the purpose that would look equally well. In the same way, if mirrors for the two larger panels are not liked, or not easily procurable (and it is not the easiest thing in the world to get mirrors to size in provincial places), very good substitutes may easily be found ; and in this case I would suggest the use of Japanese leather paper, which makes good and handsome panels if judiciously chosen. Lincrusta Walton is another material well adapted to the use of the amateur, and if panels are not made exactly to this size, a pattern might, no doubt, be selected from which a suitable piece might be cut. Other substitutes will no doubt suggest themselves, such as inlaid wood or fretwork; the latter, however, being hardly appropriate in this particular case. I have seen crewel work used for the panels of cupboard doors and other things similar to the one under consideration, but cannot say that I am satisfied with the effect. However, I will presume that you are going to use mirrors with bevelled edges.

Commence the construction by planing up the two outside uprights, $1\frac{1}{4}$ inch wide by $\frac{3}{4}$ inch thick. Then plane up sufficient to cut the six cross pieces, A, B, C, D, E, F, Fig. 2, 1 inch wide by $\frac{3}{4}$ inch thick. The top and bottom pieces, A and F, are left square

in section. If you have decided to use bevelled glass for the two top panels, cut the cross pieces, B, C, and D, to section shown in Figs. 4, 5, and 6 respectively. This will be worked with the rebate plane. If for the mirrors you intend to substitute wood panels covered with leather paper or other material, the bottom of the rebates, where bevelled to receive the bevelled edge of the mirror, as at B, Fig. 4, will have to be cut square, as at *f*, Fig. 6. The cross piece, E, Fig. 3, is rebated as shown in Fig. 6. The two short uprights, G and H, Fig. 3, are 1 inch wide and $\frac{3}{4}$ inch thick, and rebated on both sides as shown in Fig. 7. Now frame up by tenoning the cross pieces into the uprights; and the two uprights, G and H, Fig. 3, into the cross pieces, D and E, but the tenons should not, of course, show through to the outside edge of the uprights.

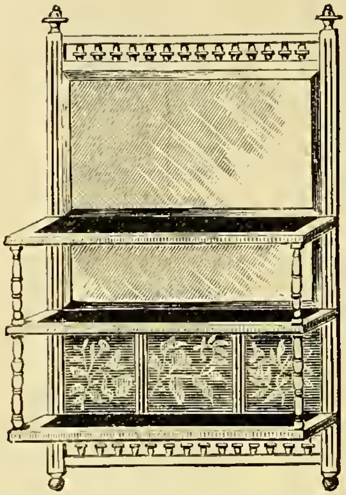


FIG. 1.—PERSPECTIVE VIEW OF SHELVES.

Having framed up, cut the rebates on the outside uprights, as shown in section in Figs. 8 and 9; this can be done by first marking the lines with the cutting gauge, and then taking out the pieces with the chisel. Before framing up the cross pieces, A, B, and E, F, Fig. 3, the short, turned columns must be put in position. To do this properly, draw a line down the centre of the bottom edge of the cross bar A, and on this line mark the position of each piece. Then draw a line down the centre of the top side of the cross bar B. Place the two cross bars with their edges together and the marked sides up; now with the square transfer the marks on the centre line of A on to centre line of B, and on the points thus marked on both pieces, make the requisite holes for the reception of the ends of the pillars, which must then be glued in position. Repeat the same process with the pieces E and F.

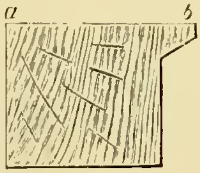


Fig. 4 on *a b*.

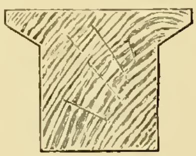


Fig. 5 on *c d*.

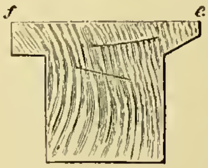


Fig. 6 on *e f*.

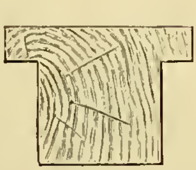


Fig. 7 on *j k*.

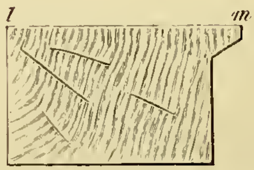


Fig. 8 on *l m*.

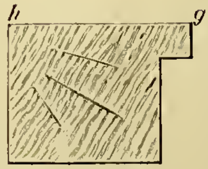


Fig. 9 on *g h*.

FIGS. 4 TO 9.—FULL SIZED SECTIONS OF FRAMEWORK IN FIG. 3, AS INDICATED.

Now put the mirrors into the rebates prepared to receive them, and back them with thin wood, glueing narrow beads all round the edge of the backing to keep it in position. Put the panels of painted wood, or its substitute, into the three bottom panels, and fix them in the same way. I have described the fixing of the panels here so as to get the framework out of hand before describing the shelves; but in actual work, the shelves had better be fixed before putting in the panels, or you will probably damage the panels.

The shelves may each be cut out of a single piece of wood, and fastened with screws put through the framework from the back, which perhaps saves trouble, but is not the best way to go to work. There are two disadvantages attending this method. In the first place, the shelves are liable to sink a little in the front, and so are not, as they should be, at right angles with the framework. In the second place, when you come to mould the edges, you will probably find it difficult to run the moulding across the grain at the end of the shelves, and even if you surmount this difficulty you are almost sure to make a mess of the corners. The alternative method is to frame up the shelf as shown in Fig. 10, and in section in Fig. 11, and mortise the two ends, C and D, Fig. 10, into the uprights, and also put screws through the cross pieces into the middle part or panel, B, of the shelf. The framing up of the shelf is done in this way:—Plane up a piece of wood, 1 inch wide and $\frac{3}{4}$ inch thick, and long enough to go round the shelf, allowing sufficient to mitre the corners and cut the tenons. Plough a groove, G, Fig. 11, down the centre of one edge, and mitre the corners as shown in Fig. 10. Now cut a piece of wood, B, for the centre of the shelf, rebate the front edge and two ends, and fit into the groove G, as shown in section in Fig. 11, and glue up. This centre piece may very well be of pine, covered with crimson cloth, glued on after the shelf is in position.

Before cutting up the strip of wood for the frame

of the shelf, mould the edge with whatever moulding you have decided to use, which must be the same as that used on the uprights and cross pieces of the main framework. For the sake of clearness, I have not shown any moulding in the drawings, but for this purpose you cannot do better than run two or three flutings along the centre of the uprights, cross pieces, and edges of shelves, with the fluting plane. If you have not got a fluting plane or a reed plane, and yet wish to have a moulding on those parts of this piece of furniture, which I have indicated as requiring this mode of treatment, you may manage to carry out the desired ornamentation by means of a router, the construction and use of which has been described too frequently in these pages to need repetition. Every amateur, indeed, who has not got planes for moulding, beading, etc., should devote a little spare time, when he has it, to making one of these routers and some suitable cutters: he will find it one of the most useful tools in his collection.

The pillars which support the outside edges of the shelves are turned in the lathe, a pin being turned at the top and bottom to let into the shelves.

It only remains now to fix the turned ornaments to the top and bottom of the uprights, and the shelves are finished. If you have used walnut in the construction it will be sufficient finish to rub well with oil: you may French polish it if you like, but on no account use varnish, for varnish used on walnut makes the wood look common, and completely spoils it. When the last touches have been given in a suitable manner, this piece of decorative furniture will be found to present a highly satisfactory appearance.

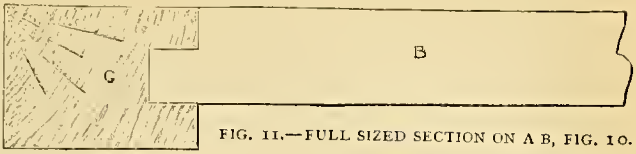


FIG. 11.—FULL SIZED SECTION ON A B, FIG. 10.

Scale of Figs. 2, 3, and 10, 1½ inches to 1 inch.

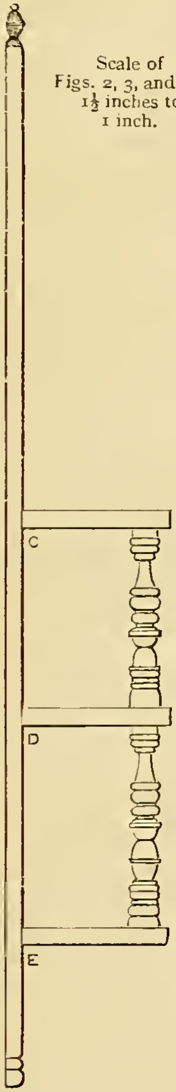


FIG. 2.—END ELEVATION.

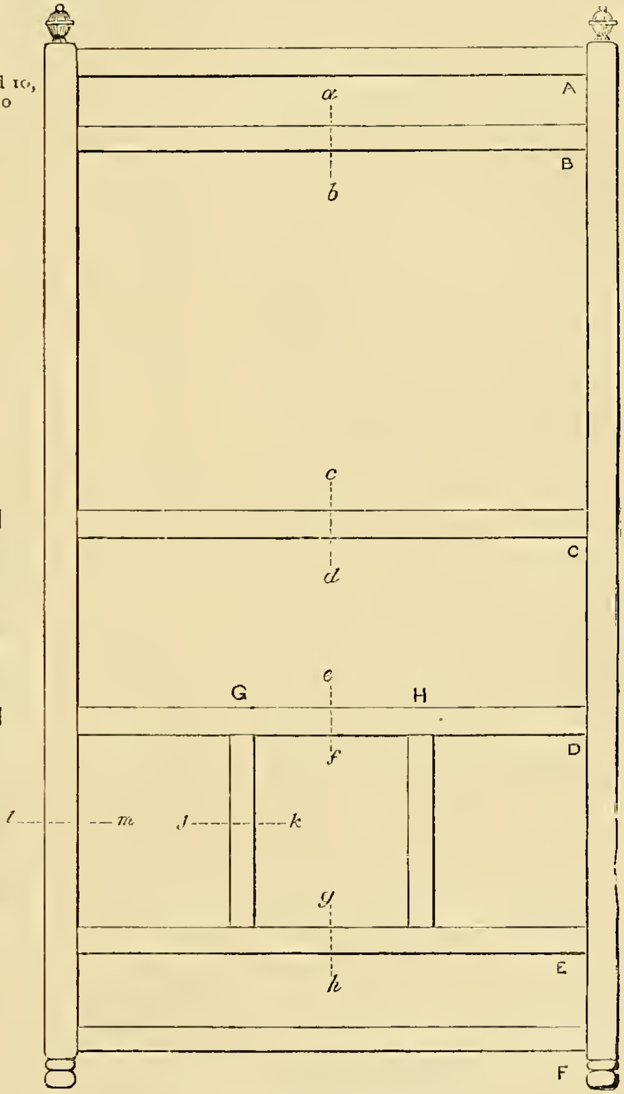


FIG. 3.—FRAMEWORK OF SHELVES.

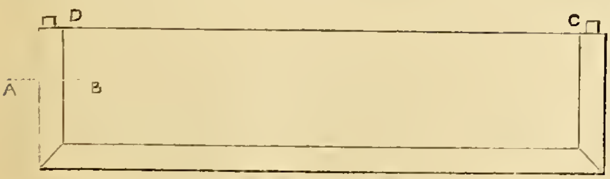


FIG. 10.—PLAN OF SHELVES.

HOW IT WAS MANAGED.

A SERIES OF PRACTICAL HINTS, SUGGESTIONS, AND WRINKLES.

FROM AMATEURS FOR AMATEURS.

I.—DRIVING WHEEL FOR LATHE.

[*From J. H. B.*]

ON page 215 of this volume, OLLA PODRIDA gives directions for making a flywheel, which are very good without doubt, but hardly suited to amateurs generally, as I take it that for one who would require such a wheel as he describes, there would be nine who want a larger one for driving a lathe that they are making at home. Now, the purchase of a driving-wheel, properly turned and grooved, would make a larger hole in a sovereign than many would care about; but by an outlay of about 7s. 6d. and a little perseverance, the following method will answer well, as I can testify, for I have made same for my own lathe, and gave extra steadiness, and the advantage of an additional wheel for driving overhead if necessary.

Get a 26-inch flywheel weighing about 35 lbs., with a 1 inch flat rim; such a wheel may be bought in *Old Street, St. Luke's, E.C.*, second hand and rough cast, of course, for about 5s. 6d. or 6s. Key this on the axle outside left hand standard; the axle must be 6 inches longer than bed, and must run on ordinary bearings, not on a pin. This wheel will carry a $\frac{3}{4}$ inch strap to overhead if necessary.

Now for our wheel to run under mandrel, we shall require a $\frac{3}{4}$ inch by 8 inches pine board, 2 feet of 1 inch pine (beech for preference), about 12 inches wide; 4 dozen *stout* $1\frac{1}{2}$ inch screws, and 8 feet of sheet iron, $2\frac{1}{2}$ inches wide. Mark on a sheet of brown paper a circle 26 inches diameter; cut out a 10-inch square from centre, divide what is left exactly into four pieces, by marking two diameters at right angles to each other; saw $\frac{3}{4}$ inch board into eight pieces, each the same as one division of the paper, but do not yet bother about rounding the circumference of the boards; make with what is left of the board a 20 inch square, this must be done by correctly shooting and joining with slips and glue. When four of the pieces are screwed on each side of this, you will have a 26 inch wheel (not yet round certainly), with a 10 inch square recess each side. Cut the beech in half, plane up, and fit each piece in this recess; mark centre same size as square axle, cut out, and then screw all up in the best manner possible for strength, which is the great aim

Be particular in screwing. Simple as it appears, many amateurs cannot put in a screw properly, only using one bit; therefore I write the following, as this wheel must be thoroughly screwed. In putting in a screw, three bits should be used—one same size as inside or body of the thread in centre of length of same, one same size as bright part under head of screw, and one countersink to bring head flush.

Put the wheel on the axle, it will probably wobble and want edging up, but do not use nails; mark as near the rim as possible with a pencil or piece of chalk (holding pencil still and *working treadle*). Take off the wheel and cut away with a chisel and spokeshave to this mark; put on the wheel again, and use the spokeshave again if it runs untruly; fasten on the sheet iron with strong flat-headed nails, having previously punched or drilled holes to receive them. We have now a wheel to carry cord or strap to mandrel pulley, and another for driving overhead. Note that the wheel may be painted with Brunswick black, if it has been nicely planed up.

II.—FLYWHEEL FOR TURNING LATHE.

[*From J. P.*]

In page 215 of this volume there is a paper by OLLA PODRIDA, telling us "How to make a Flywheel." If you can allow me space, I will describe how I made one some time ago, which, I venture to say, is much cheaper, and, at the same time, more within the capabilities of amateurs. Perhaps some of your readers may smile when I mention what it was made of: viz., wood and concrete. In making my one, I got two pieces of wood, $2\frac{1}{2}$ inches by 3 inches, and 25 inches in length, which is the diameter of my wheel, having no room for a larger. With these I made a cross, notching them into each other, the way some barrow wheels are made; then about $7\frac{1}{2}$ inches from the centre I put short circular pieces, $\frac{3}{4}$ inch by $2\frac{1}{2}$ inches between each arm, notching the ends into the arms, and then nailed $\frac{1}{2}$ inch boards on each side, cut circular to form felloe of wheel. My next step was to find centre of cross on both sides of wheel, and set my compasses to size, tracing a line round and cutting the boards to insure it being round and true. There are now four compartments to be filled with concrete. To do this, get some cement and round sand or shingle, and measure, say four or five parts of sand to one of cement; mix with water, fill one compartment, and nail narrow pieces $\frac{1}{2}$ inch thick across, nailing into side-boards to hold in concrete, and form the outer edge of the wheel; then another compartment, and so on, till all are complete. Cut a hole through the centre the size of the axle, and put a small plate of sheet iron on each side, so as to afford a firm bearing for the wedges. After wedging as near true as possible, by erecting a box for a rest, turn the edge to take on the belt, but see that the nails are well punched in. Between the felloe and centre, I cut deep chamfers partly to make it look better and partly to lighten centre of wheel, and for the same purpose I cut away part of the wood at the point of the arms, as concrete is heavier than wood, and the heavier the rim is the better; but to make the arms of lighter wood would serve the same purpose. I hope I have made my method of procedure clear enough without any diagrams; but if anyone wishes to make one, and does not exactly understand the description, with your permission I will readily answer any questions they may wish to put to me on the subject.

III.—HOW TO SPLIT PAPER.

[*From W. E. H.*]

Thoroughly glue both surfaces of the paper and place it between two pieces of calico, taking care that the glue is good and strong, and that the two sides of the paper are well stuck to the two pieces of calico. When dry, pull the two pieces of calico apart, and one-half of the sheet of

paper will be found firmly glued to each piece of calico. The two pieces can be easily soaked off the calico in hot water—the paper having thus been split through the very centre of its substance. This will sometimes come in very useful. For instance, if you wish to preserve a cutting from a newspaper to paste in a book, and the article happens to run down two sides of the newspaper sheet, it can be split and the two halves pasted in their proper position in the book, which could not be done without splitting. [This "wrinkle" was accompanied by a piece of the pink advertising sheet of AMATEUR WORK, partly split down without injury to either side. ED.]

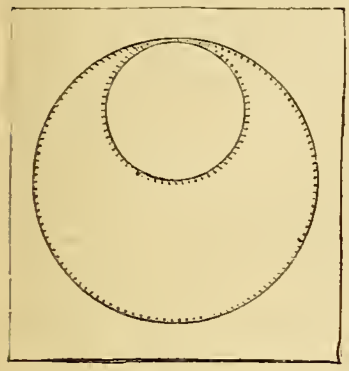


FIG. 1.—GEOMETRIC PARADOX—FRONT VIEW.

IV.—GEOMETRIC PARADOX.

[*From CHACKA.*]

Some years ago I was on a committee appointed to prepare an exhibition in one of our Colonies, got up for the benefit of the local charities, and intended to bring together what was worth seeing—viz., pictures, curiosities, etc., to be lent by the colonists, and to amuse and instruct by means of music, lectures, etc. It is not my purpose to give even an outline of the very successful programme that was the result of our efforts, but to bring before the readers of AMATEUR WORK one of the trifles I had the pleasure of adding to the general collection, and which very much interested the visitors. I called it the Geometric Paradox, for want of a better name; its object was to show that a disc turning on its own axis and revolving round the rim of an inner circle double its own diameter, produces only figures formed of straight lines. As the instrument can be easily put together, and may be formed of any convenient material, it will be good exercise for our amateur friends and test their ingenuity in its formation.

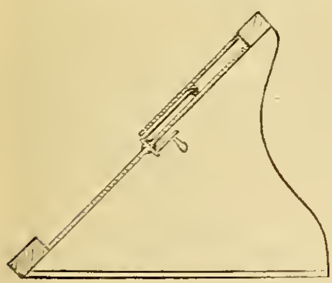


FIG. 2.—GEOMETRIC PARADOX—SECTION.

The one I have referred to was made of wood, 8 inches square and $1\frac{1}{2}$ inches thick; in the centre a circular hollow was turned out 6 inches diameter and $\frac{3}{4}$ inch deep, leaving a slight prominence round the centre hole, so that the arm carrying the disc might freely rotate; it was covered with dark cloth, and made to bear against the inner rim so as to cause it to revolve on its own axis whilst being turned by the winch, and a few pearl beads fastened on the disc, as in Fig. 1, showed various figures, but all in straight lines. This board was fixed in a frame at an angle of 45°, as shown in Fig. 2, for convenience of turning handle behind.

Doubtless, a better way to make the instrument would be to use a clock wheel for the disc, with cogs, and the inner circle to have similar cogs, so that in revolving the cogs would cause the disc to revolve more regularly than if done by the mere rubbing of one surface against the other.

Whatever plan is adopted, the making the disc and its surrounding should be of a dark colour, in order to show the figures made by the pearl beads on it whilst revolving.

NOTES ON NOVELTIES.

By THE EDITOR.

44. OAKEY'S "POLYBRILLIANT" ROUGE POMADE.

AS the work of imparting a polish to any smooth metal surface is always laborious and often unsatisfactory in its results, it may be taken for granted that any preparation which will tend to lessen the application of "elbow grease," and to render the attainment of the desired end a matter of certainty, will be gladly welcomed by those sections of the general public who require to have the work done, on the one hand, and who have the work to do, on the other. That these sections, taken together, comprise a very large contingent of the British public there can be no doubt, and that a large number of amateurs are included in both is equally certain; and it is for the benefit of all who have articles of polished metal to keep bright, whether willingly or unwillingly, that I wish to call attention to Messrs. John Oakey and Sons' new polishing paste, the "Polybrilliant" Rouge Pomade, which I have had tested on steel goods, tinware, and plate, and find to be a first-class medium for imparting in a very short time, and with very little labour, a brilliant polish to all kinds of metals, including those already named, and brass, pewter, copper, electro-plate, and Britannia metal.

It is declared by the manufacturers, Messrs. John Oakey and Sons, of the *Wellington Mills, Westminster Bridge Road, London, S.E.*, to be perfectly free from acid, mercury, or any other injurious and poisonous ingredient, and being composed only of the very finest materials, cannot scratch or injure the article cleaned. Among the advantages over similar preparations that it possesses are, that it is always ready for immediate use, simple in application, speedy, and lasting in effect; economical, as only a very small portion is required at a time; and never affected by climate or age, which generally tend to render other metal-cleaning pastes dry and hard. When used, all that is necessary is to apply a little of the pomade with a rag, wipe it dry, and then polish by rubbing briskly with a soft cloth or wash-leather. It is sold in tin boxes, at 1d., 2d., 3d., and 6d. each, by ironmongers, oilmen, druggists, grocers, and brush-makers, and there should be no difficulty in getting it anywhere or at any time. If the tradesman with whom you deal has not got it, ask him to keep it in stock: he will soon find it worth his while to do so without asking.

AMATEURS IN COUNCIL.

1. *Contributors to* AMATEUR WORK *are requested to write on one side of the paper only, and Correspondents when asking or answering Questions in "Amateurs in Council," are also requested to write on one side of the paper only.*

2. *When Illustrations or Diagrams are necessary, draw them on a separate piece of paper, because the "copy," as the manuscript is technically called, has to go to the printer, and the illustrations to the engraver.*

3. *Abstain from the epistolary form, as it is utterly unnecessary, unless in letters of business. Put the question you wish to ask, or the reply you wish to make, as briefly as possible, and write every separate question and every separate reply on separate pieces of paper. Sign each with initials, nom-de-plume, or name and address, as preferred.*

4. *Let every paper be headed* AMATEUR WORK, *and follow these words with* "Information Sought," *when it is a query;* "Information Supplied," *when it is an answer to a query; and* "Sale, Purchase, and Exchange," *when it concerns anything to buy, sell, or barter.*

5. *It must be fully understood that no attention will be paid to any letter or communication in which these rules are not rigidly observed.*

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine, the information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

Model Engine Building.

TYPO.—No papers on Model Engine Building have yet appeared in AMATEUR WORK. You say in your letter, which bears date, April 25th, "Please reply in May Part." As a "Typo," you will understand the impossibility of doing so, because the May Part went to press long before your letter was written. I say this to allay your disappointment, as a new subscriber, in not getting a reply as quickly as you expected.

Woods: their Qualities and Uses.

STILL MORE.—You will find a description of the qualities and uses of the different kinds of plain and ornamental woods in "Every Man His Own Mechanic," to which I must refer you.

The "Shipman" Engines.

WESTWOOD.—On reference to my copy of the prospectus of the "Shipman" Engines, I find that the quotations of prices given by L. S. D., are as stated by him—namely, No. 1, 50 dollars, or £10; No. 2, 100 dollars, £20; and the promised, No. 3, 150 dollars, or £30. Look at your price list again. It seems doubtful that the manufacturer has increased his prices 100 per cent. In my prospectus, the price of No. 1 Engine, with illustration, is given on back of wrapper.

Stain for Violin.

J. M.—You will find all the information you require on the method to be followed, and the materials to be used in finishing a violin with stain and varnish, in Vol. III., page 106 (or Part 26, January, 1883) of this Magazine.

Electric Regulator for Incubator.

INCUBATOR.—The Editor of AMATEUR WORK has forwarded me your letter of April 14th. The electric regulator described by me, although solely my invention, has not been patented, and your friend has perfect liberty to use it for his incubator. Any further information or help in the matter I shall be pleased to give. A letter addressed to me, care of the Editor of AMATEUR WORK, will always be attended to.—CATO.

Le Page's Carriage Glue.

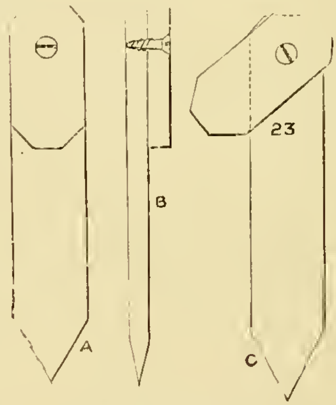
PHONETIST, writing from *St. Petersburgh*, says:—"In page 250 of this Volume of AMATEUR WORK, B. H. F. (*St. Petersburgh*) speaks about his having got some carriage glue from England. Will he please tell me how he gets his things from England? I have found great difficulty in doing so; also, through what medium he gets AMATEUR WORK? I got the first two Numbers two mouths too late, the others came a little earlier." [Will B. H. F. kindly answer? As affording information supplementary to the notice to which PHONETIST refers, I may say, that I have gathered from a recent advertisement, that Messrs. Richards, Terry, and Co., 46, *Holborn Viaduct, E C.*, also supply Le Page's Liquid Glue.—ED.]

Watch and Clock Maker.

APPRENTICE.—Write to Messrs. Iliffe and Co., Printers and Publishers, *Coventry*, and in all probability they will be able to give you the information you require respecting the above-named paper.

New Garden Label.

LOIDIS writes:—"I send sketches of a new kind of garden label, for the use of those who are going to grow pansies, or any



NEW GARDEN LABEL.

A, Label closed; B, Side view of Label; C, Label open.

other plants. The number or name of the plant should be written on the long piece, and the short piece or cover turned over it. Each label should be made of one piece of wood, any kind, 4 inches by ⅝ inch, by ¼ inch, one piece 1½ inch by ⅝ inch by ¼ inch, and one ½ inch brass screw. I think the drawings will explain the rest."

Coils for Needle Telegraph.

A KENTISH MAN.—I hope to supply an illustrated article soon, on "How to Make a Telegraph Instrument," when your requirements will be met.—G. E.

Relative Proportions of Induction Coils.

G. W. (*Amble*).—A table of relative proportions of the parts of Induction Coils will be found in my article on the subject.—G. E.

Fly-Wheel for Lathe.

MATHETES.—The fly-wheel should be about twenty-six inches in diameter, and from 50 to 60 pounds in weight. If you want a high rate of speed, let it be about twenty-eight or thirty inches diameter, and same weight. Weight being similar, a 30 inch would have an advantage over a 20 inch, inasmuch as the storage of power would be greater, and the speed higher, with the same rate of "treadling." Crank shaft, 1¼ inch diameter if about four feet long, if about two feet long, let it be 1⅛ or 1¼ inches diameter; this will, of course, depend on the distance between your supports. A cranked shaft is the simplest, and quite as effective as the shaft with cranks fitted on the ends. The latter form is most expensive, and involves much more labour. If the shaft is long, you may crank it in two places, near each end. If a single crank is made, it should be as close as you can get it to the fly-wheel. More information, if necessary, will be given with pleasure.—OLLA PODRIDA. [In this Part of the Magazine, OLLA PODRIDA commences a series of papers on the "Construction of a Six-Inch Wooden Lathe," which amateurs, generally speaking, will be better able to make for themselves than an iron lathe. The Folding Sheet accompanying this Part exhibits the plan, front elevation and end elevation of the lathe on a large scale, with other parts of the machine, and from it, I think, you will derive valuable assistance with reference to the treadle of your own lathe.—ED.]

Fret Saw Attachment to Lathe.

NOUS writes:—"I have succeeded in making a scroll saw attachment for my lathe, from the instructions given in page 295 on the subject. It is, of course, much larger than that described, as my lathe is 6¼ inch centre, with 7 inch saws, which belong to the 'Barnes' Pattern Foot-Powers Scroll Saw.' I can cut a small circle out of 2 inch stuff with the utmost ease. I am very much pleased with it, and so is every one who sees it, especially as I am not much of a workman."

Preparation of Ferns, etc., to Receive a Deposit of Copper.

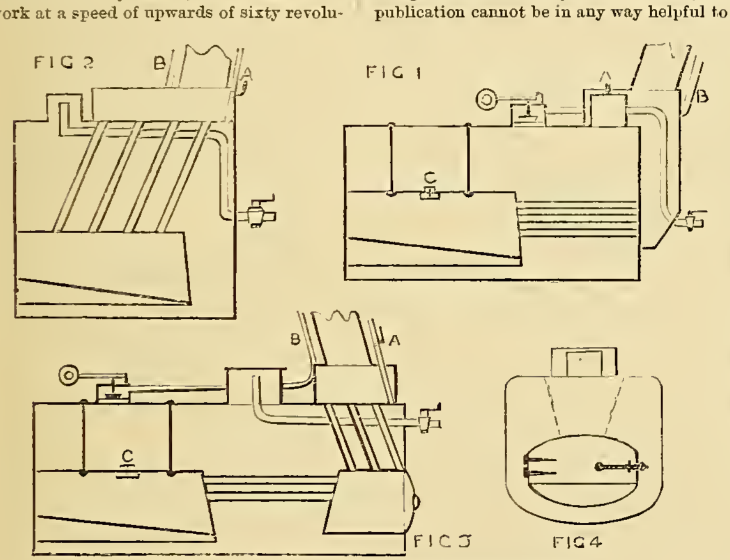
G. W. (*Amble*).—The method of Mr. Parkes is certainly most objectionable, both on account of its offensive character and the danger alluded to by yourself. My brother has employed for a similar purpose, with success, one of those ethereal solutions of silver used by makers of capsules for champagne bottles. The stuff was priced 7s. 6d. per pint, but I don't know its composition. It was only necessary to dip any article in the solution, when it became coated with a thin film of silver.—G. E.

A Query for Turners.

ENQUIRER writes:—"I am much indebted to G. C. C. for his reply, page 358, and to the contributor who previously answered my query. Yet, being unskilled in elaborate turning, and having only a somewhat primitive lathe, I cannot easily test their information. I should deem it a very great favour if any reader who has succeeded in turning a knob according to my diagram, would post it to ENQUIRER, care of Editor of AMATEUR WORK, I would gladly defray cost." [Any one who happens to have a specimen of turning of this kind may safely entrust it to ENQUIRER,—ED.]

Model Engine and Boiler.

A. F. S. (*Dresden*) writes in reference to query put by S. M. L. (*Goderich, Canada*) in page 308:—"That, if S. M. L. will write to A. A. Dorrington, *West Gorton, Manchester*, he can obtain drawings of a Compound Condensing Screw Engine for 3s. 6d. If by 'compound,' S. M. L. means the kind of engine in which the steam enters a cylinder of small diameter at a pressure of say, 70 lbs. per square inch, and is afterwards expanded in a cylinder of much larger diameter, I cannot tell him of any catalogue in which it may be found, or where to obtain working drawings. Dorrington might probably tell. I am very busy just now, or I would offer to make scale drawings of engine and boiler of any type that S. M. L. might choose. S. M. L. must not suppose that because an engine costs £50 it is good for working; these high-priced models are exact and correct in every detail, and when set to work at a speed of upwards of sixty revolutions a minute, they soon go to pieces. If the low pressure cylinder has a diameter of $4\frac{1}{2}$ inches, the engine might possibly work with a powerful boiler, but beware of explosions. But if the low pressure condensing type of engine is meant, I see no difficulty in making it. Now, as to boiler, I enclose some sketches, surely one must suit. Fig. 1, will, I think, suit S. M. L. the best. Fig. 2 was designed for a paddle engine, with fore and aft boilers. Fig. 3 is rather heavy, use two safety valves, and with fixed weights in preference to spring balances. Furnaces, as in Fig. 4, give greater heating surface than round ones, but stays are required; at A I fix the whistle, C, the lead plug, E, for steam from safety valves. Don't make furnace less that 3 inches high and $4\frac{1}{2}$ inches wide, let there be $1\frac{1}{2}$ or 2 inch steam space. Slope the ends and sides of furnace, let tubes be $\frac{1}{4}$ inch to $\frac{5}{8}$ inch diameter, and don't let space between furnace and boiler be less than $\frac{3}{8}$ inch or $\frac{1}{2}$ inch. 1 inch to $1\frac{1}{2}$ inch of water should cover furnace. Fig. 2 has two furnaces, and is difficult to make, but steams well." [With regard to your postscript, I am compelled to say that I endorse everything that has been said by Olla Podrida in his replies to you. Your questions are, no doubt, put in good faith, but they are not put in an intelligible manner — intelligible, at least, to us. It is seldom that any of us can precisely understand what you mean, or see what you are aiming at. Everyone to whom I send your queries says much the same as this. There is no necessity to go further into the matter of wages paid to German workmen. If you cannot get a lathe to suit you from the Britannia Company, I do not know to what maker to direct you. In your letter of April 13, you say that you "fail to understand what S. M. L. (*Goderich, Canada*) requires" with regard to his Model Engine and Boiler. This being clearly the case, and your letter being further of a *negative* character, its publication cannot be in any way helpful to S. M. L., and so I do not insert it. I trust you will do me the favour not to attempt to answer queries unless you perfectly comprehend what is wanted. I give you full credit for being animated with the best possible intentions, but I really cannot afford to sacrifice space by the insertion of long letters, which, when they are duly sifted, amount to nothing, and contain no truly practical and useful information. —Ed.]



BOILERS FOR COMPOUND CONDENSING ENGINES.

Burnishing Gold.

J. W. (*Crewe*).—Refer to the papers, entitled, "The Art and Mystery of Gilding," in Vol. III., of this Magazine, or if you have not got the volume in question, in Parts 25 and 27. Burnishing is effected by rubbing the gold with a steel or ivory burnisher.

Magic Lanterns.

Savoir Faire writes:—"I have succeeded splendidly in making a lantern from Mr. Beckerlegge's instructions, given in Part 36, although a mere novice in such matters, and having never seen anything on lantern making before the article in question appeared. I have given an entertainment with it, which was a very successful affair. I also made my lamp, although against Mr. Beckerlegge's advice, with a patent Duplex burner, and succeeded well with it."

Drawing Plans.

Rob Roy.—Your query is very vague. If you will tell me what trade you are following, as an apprentice, I can better help you. Meanwhile, let me advise you to take in "The Technical Journal," now publishing in monthly parts at 6d., by Messrs. Ward, Lock, and Co. I know of no cheap book on Inlaying, but you will find papers on this subject from time to time in this Magazine. Write to me again, and tell me what your work is, that I may help you, if possible.

Electro Motor for Revolving Vacuum Tubes.

C. H. L.—The number of wire is 18's. The same battery supplies both motor and tubes, but one cell is used for the motor and another cell for the induction coil to illuminate the tubes, as in one case we want a direct current and in the other an induced current only. I have worked the motor alone, with bichromate cell, having zinc 2 inches wide, and exposed in solution to a depth of $\frac{1}{8}$ inch. If immersed in liquid to depth of $\frac{1}{2}$ an inch it will be amply sufficient. The flanges of the bobbins are $\frac{1}{16}$ inch thick, and not $\frac{3}{8}$ inch. If you will re-read carefully you will find this so. See former reply respecting space lengthwise between the flanges—it is $1\frac{7}{8}$ inch. The flywheel will do if of wrought iron, those used (generally) in model steam engines are brass. The spindle will do of brass; cast iron is bad, and wrought iron is far better than cast.—Lebasi.

Magnet.—Thank you for pointing out errors. In page 316, column 2, line 10, instead of "and $\frac{7}{8}$ inch long," read "and $1\frac{7}{8}$ inch long." In page 318, column 2, line 13, instead of "$3\frac{21}{32}$ inches distant," read "$3\frac{19}{32}$ inches distant;" and in same page and column, line 18, read "$3\frac{21}{32}$ inches," instead of "$4\frac{1}{32}$ inches." In reply to other questions: For Nos. 1 and 2, see above. No. 3. The wires from the induction coil not the bobbins. No. 4. The wire round pulley D, Fig. 8, extends all round, so as to make contact all the way round. No. 5. The material for the spindle is immaterial (pardon the apparent absurdity). No. 6. For the holders, see page 319, column 1, line 4 from the bottom. No. 7. The current through the motor is through binding screw, F, through the wire on the bobbins, then through make and break contact (Figs. 12 and 13) standard, and then through the other binding screw to battery.—Lebasi.

Colouring Inside of Book Shelves, etc.

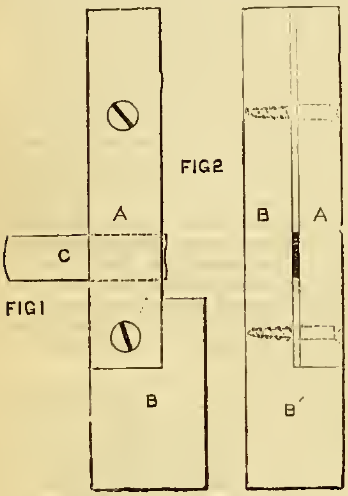
R. H. (*Westminster*).—The method usually adopted for colouring the inner surface of book shelves, cupboards, etc., is to mix red ochre and size, about ½d. worth of each would be sufficient, boil the size, mix, and strain through muslin, apply it with a brush; or the surface could be stained and fadded in with red polish, as described in the papers, "French Polishing," already given in this Magazine.—J. H.

Bookbinding.

Fenman.—(1) I cannot answer your first question, relative to "the split case process of binding magazines," but I think the process must be some patent, which I have not yet seen. If you could send me the advertisement to which yon refer, it might help me to give a definite auswer. (2) Yon can get your materials from Eadie and Son, *Great Queen Street, London, W.C.* Write to them. There is no firm in Peterborough that supplies bookbinding materials. (3) The reply to question two also practically answers your third question. (4) Hints on Marbling Edges shall be given when I have time to write a paper on the process.—Author of "Bookbinding for Amateurs."

Scratch Router.

Loidis writes:—"Having seen a scratch router, or scraper, described in page 306, I have seut a drawing of a different kind, which, I think, is more useful as it will



SCRATCH ROUTER.
Fig. 1. Side View or Elevation. Fig. 2. Plan.

work either convex, concave, straight, or irregular mouldings. The piece, A, is movable, and held by two common wood screws; the cutter, C, is placed between A and B, the screws are then tightened, and it is held quite firm. The cutters may be made of a piece of saw blade or spring steel."

Walnut Juice.

D. D. (*Hillhead*).—You ask where you can procure walnut juice. It is not an article of commerce, as far as I am aware, but when walnuts are ripe, or even before this, when they are ready for pickling, subject the husk, or thick outer skin to pressure, and you may get any quantity. But take care how you haudle them, as the juice stains.

Blue Printing Process.

D. B. A. writes:—"I have not noticed any of your correspondents having written about hot water for washing prints. I have tried this, and find the prints are washed much more quickly—in fact, if the water is hot enough they are developed and washed almost instantaneously. The hint may be useful to some."

Melting Brass.

B. E. T. (*Surbiton*).—There is one word in your query which shows the secret of your not having accomplished the rather difficult job of melting brass. You speak of putting the brass in a *ladle*, you must drop the ladle and adopt a *crucible*, to be obtained at most practical chemists or dealers in scientific apparatus, such as Mr. Thomas Fletcher, *Museum Street, Warrington.* Then proceed as follows: Make up a nice fire, previously clearing the bottom of the grate well out, use the partly burnt cinders which fall out of the fire, having the grate half full of fire, place the crucible in the centre aud near the back (of course, filled with pieces of old brass), then pack all round with the cinders until you reach the top of crucible, put a large cinder on the top as a lid, then cover completely over with the fuel—you need not be afraid of anything falling in the crucible; the flux is, of course, put in with the brass. Now open the door or window to get a good supply of air, close up every available air space round the fireplace (if you have not a furnace), having only the bottom of the grate exposed to draught. If you have a bellows, that will help, though I never used one. Leave the fire until every part is white heat, and if your brass is not melted, it will be the first time I ever heard this method fail.—F. J. D.

Cheap Microscope.

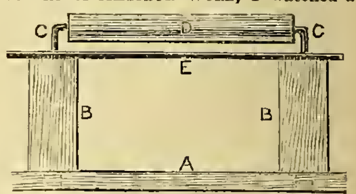
O. B. writes:—"I hardly think A Disappointed One, page 355, can lay the blame on the instructions given as clearly. He has not followed them. One feels curious to know what optician would recommend a double convex lens for the eye-piece. It must be remembered that whether a microscope is to cost a few shillings or many pounds, the same optical laws *must* be observed. A double convex lens, with a given radius, is of shorter focus than a plano convex. The eye-piece, and not the instructions, evidently, is at fault. Were the lenses *picked* up as odd ones, or were they bought at a respectable optician's as a set? The eye lens should be a plano convex, say, 7 inch focus, the field lens double the focal length of eye lens, and separated one-half the combined length of their focus, which would be 1½ inch. There is no positive rule as to the length of focus, but they must be in the proportion indicated, and the length given is a suitable one, unless these rules are observed, the lenses will be out of focus, and the mistiness of which A Disappointed One complains will be the result."

Dry Batteries.

M. W. (*Burnley*).—You evidently refer in your letter to a form of battery patented by Skrivanoff some time ago, and only useful for fitful work, such as occasional signalling. I am not sure of the chemical reactions taking place whilst boiling such a mixture as that of $HgO+NH_4Cl4$. Perhaps an amalgam of Hg and NH_4 is formed, and this, together with some Hg_2Cl forms the paste; this is mixed with $ZnCl+NaCl+HO\ SO_3$ to form the battery paste. Electrical decomposition probably throws Hg, Zn, and Na, on the zinc plate as an amalgam whilst NH_3 and Cl is thrown off from the carbon plate. Such complicated mixtures rarely work well. Skrivanoff's latest form is simply a silver chloride battery, with the addition of a caustic alkali. Dry batteries are costly and useless for real electric lighting. Of course, they cannot be used with accumulators. Know you not that the strength of a chain of electric batteries is only equal to the strength of the weakest cell in the chain? A "dry battery" offers more resistance to the passage of the electric current than a battery of accumulators, and the strength of these would be consumed in overcoming the resistance of those; besides, how would you charge the accumulators? Electric power must be consumed in charging them, and you are not likely to get out of them more than 80 per cent. of the power thus put in, so to speak. It is therefore more economical to use a powerful battery direct, and many such are advertised for electric lighting.—G. E.

The Primitive Lathe in Egypt.

C. H. O. (*Cairo*) writes:—"Since reading the description of the Primitive Lathe, by An Old Boy, in page 153 of the present volume of Amateur Work, I watched a



PRIMITIVE LATHE IN EGYPT.
Front Elevation.

native in the bazaar at work with the lathe used here. It is somewhat simpler than that described as used in India, inasmuch as it can be used at the table or elsewhere, and requires only one man to work it. It consists of a flat board, A, with two upright blocks, B, B, fastened to it; into the two uprights are driven bent spikes, C, C, as in the annexed illustration, between which the work, D, is fixed. The tool-rest is an iron bar, E, lying across the uprights. The lathe is driven by a bow, the string of which is passed round the work, or chuck, and is worked with the right hand, while the tool is held in the left. Some very good work is turned out by these lathes. Many of the oriental patterns of brackets, stools, etc., would interest your readers; but I cannot draw, or I should send you some."

Cleaning Badger Hair Brush.

Difficulty.—If clogged with oil paint, soak in warm water containing washing soda, and handle the hairs in the water until they are freed from the paint, then wash well in clean warm water alone. If clogged with varnish, wash the brush in turps, and gently press the hairs against the sides the vessel until they become soft, then well-wash out in warm water.—G. E.

French Polishing without Fire.

French Polish.—If the wood be perfectly dry and the weather temperate it is not at all necessary to use a fire, only when either cold weather or wet wood turns the colour of the polish to a greenish or whitish shade is it necessary to use a fire or heat of any kind, and then only sufficient to bring back the normal colour.—J. H.

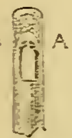
Music Printing Outfit.

MUSICUS writes in reference to his and my remarks in page 355:—"Having referred to two notices in my communication, I did not think it necessary to say my apparatus was by Jabez Francis. The specimen you speak of so highly in the notice heading mine, is the lithographed one mentioned by me. I did not send any address, being of opinion that no one (outside Hanwell) after reading the description would require it. However, as you desire, I enclose an address which will find me. 'Better than new' means that the pins will now work in the slots, which they would not do when purchased." [Then why did you offer it at half price, or, indeed, offer it at all? However, I can now send your address to any one inside or outside Hanwell, who wishes to acquire your "better than new" outfit at half price. Any one who desires to communicate with MUSICUS must send an envelope stamped and addressed.—ED.]

INFORMATION SUPPLIED.

Electric Gas Lighter.

TWIST DRILL writes in reply to G. P. (*Glasgow*):—"One pattern of electric gas lighter is made with a chloride of silver battery in the handle, and a bit of platinum wire in the extremity of the rod, rendered incandescent by closing the circuit by the button; and another pattern has a similar battery, and a small coil in the handle, producing a spark between two carbon points of this shape. I believe any one may make a patent article *for his own use*, if he does not sell it."



ELECTRIC GAS LIGHTER. A, A, Carbon Points.

Carbon Papers.

NOUS writes in reply to C. (*Lisbon*) page 359:—"There is a receipt in 'Spon's Workshop Receipts,' which may meet your case. It is a very good one, I know from experience, and I give it in full, as it may be useful to other readers besides yourself, who do not happen to possess the book. It answers admirably for transferring fretwork embroidery patterns, etc.

"*Manifold Writing Papers.*—The white paper is only very fine thin writing paper. The black is soft paper, prepared by being smeared with a composition of grease and plumbago or lampblack; this mixture is allowed to remain on for twelve hours, and the paper then wiped smooth with a piece of wool or cotton-waste. Place white paper over black, and write with a blunt point."

Lathe Castings.

TWIST DRILL writes in reply to C. J. D.:—"My lathe has a conical piece of steel tube, forming the neck, let into the headstock, which, of course, can be easily tempered."

Water Engine.

TWIST DRILL writes in reply to G. P. (*Glasgow*):—"Water will drive a common slide valve cylinder, if the cut-off valve is removed."

Furniture Cream.

BING writes in reply to L. L. (*Leek*):—"Take 1 oz. of white wax, cut up and melt in half pint of turpentine; then take 1 oz. of Castile soap, cut up and melt in pint of water; mix the two preparations while the latter is hot. I have used this for years with great success."

Best Motor for Small Lathe, etc.

F. W. D. (*Holloway*) writes:—"In reply to C. J. D., I may tell him (1) his boiler will have to be 6 inches by 3 inches over all. (2) A steam engine is very much cheaper, to drive a lathe, than an electric motor. (3) He will have to heat his mandrel, etc., in an iron pipe, stopped up at each end, with coke or charcoal, and then chilled, but it is quite beyond the province of an amateur to do it.

Re-Tinning Stewpans.

G. E. writes in reply to J. C.:—"Scour out all traces of rust by means of canvas and sand, wipe out clean, put in a few grains of granulated pure tin, and place the stewpan on the fire until the tin begins to melt. Then take a wisp of tow in the right hand, smear the tow with tallow, and wipe the melted tin all over the defective parts whilst the vessel is held firmly with the left hand."

T. H. (*Shepherd's Bush*) writes in reply to J. C.:—"First thoroughly clean your stewpan, if of copper, by first boiling in it a strong solution of washing soda, and then scouring well with a brush and some wet sand. If of iron, it should be 'pickled' by filling it up to the brim with a solution of sulphuric acid, one part of acid to twelve parts of water, after it has been boiled with the soda, and then scouring as before mentioned. About fifteen minutes will be long enough for the pickling, but they *must* be clean. Then, after getting your stewpan thoroughly clean, place in it some pieces of *tin* (solder will *not* do, being poisonous, as it contains lead), and some powdered salammoniac, and then place it over a clear fire until the tin melts, when it can easily be run all over the surface of the stewpan by turning it round, and occasionally dusting a little salammoniac on it; be careful not to get it too hot or you will spoil all, just hot enough to allow the tin to run freely, and don't spare the salammonaic; but I should advise you to do the job where there is a draught to carry away the fumes, as they are rather disagreeable. You can tin copper vessels by using killed spirits of salts, rubbing it on with a rag dipped in the spirits; but with iron, you must use salammoniac. This method of tinning will give a good coat of tin quite good enough for cooking utensils, but if you want a nice shiny surface, it can easily be got by heating the article all over equally, and wiping it all over the inside with a piece of rag, wrapped round your hand; be sure and use plenty of rag (any old rags will do) or else you may get burned."

Prize Demas Fret Machine Lathe.

F. C. H. (*Hoddesdon*) writes in reply to A. W. W. (*Gateshead-on-Tyne*):—"I have had a Demas fret cutter lathe, circular saw, emery wheel, and drilling machine, for some three years; it does firstrate work, as regards the fret machine. The lathe will do for napkin rings, chessmen, boxes, chucks, and small work (under 15 inches long, and 2½ inch centre, and I have turned a mallet, or rather, fret saw handle, nearly 5 inches in diameter, but this heavy work makes it rock a little. Altogether, for a duffer, like myself, it is a very cheap good toy. I had a brass face-plate made, and turned it true on it. A. W. W. will have to make such chucks as he wants. A prong and an attachment for fret cutting are the only chucks sent with it." [You sadly libel yourself when you call yourself a "DUFFER." You ought to know better.—ED.]

TWIST DRILL writes in reply to A. W. W. (*Gateshead-on-Tyne*):—"A friend of mine has used a Prize Demas for some time, and has done the greater part of the turning for a 1 inch bore launch engine on it, without a slide rest."

Painting Dog Cart.

TRULY RURAL.—I must request you to carefully read the articles on "House Painting," and specially the section on Brushes, Materials, etc., in pp. 256 and 257, Vol. II., of AMATEUR WORK. You will then be able to more clearly understand the following brief directions: Well prime the new wood with lead colour, made up in oil, rub down smooth with glass paper, apply second coat of lead colour, made up in half oil and half turps, using ultramarine alone to give the tint, rub down smooth with fine glass paper. Finish coat for outside, must be made up with white lead, tinted with half Prussian blue and half ultramarine, ground with gold size and turps, and well strained. Inside, same mixture, tinted with vegetable black, instead of blue. Line with colour tinted with Prussian blue. Rub all down smooth with a linen pad dipped in powdered pumice-stone. Varnish with best carriage varnish, well strained, two coats. Rub down first coat with pad of wash leather, dipped in powdered pumice-stone. Use pound brush for body colour, sash tool for shafts, etc., and camel's hair pencil for lines. You must apply to colour shops in Grantham for prices of materials.—G. E.

INFORMATION SOUGHT.

Cleaning Terra-Cotta Plaques.

S. C. L. (*Manchester*).—Will any reader let me know how I may clean some terracotta plaques? They have flowers painted on them in oil colours, and all round the flowers, but not on the paint; there are dirty marks, which seem to be finger marks or dirt of some kind.

Satin Polish for Boots.

BING asks:—Can any reader give receipt for satin polish for boots?

Repairs of Violoncello.

VIOLONCELLO puts the following queries:—(1) By substituting the original top block of a violoncello by a wider one, say 1 inch, ¼ inch each side, shall I impair the tone of the instrument thereby? I am thinking of doing this to repair one of the ribs, broken close to top block. (2) On joining the halves of the unjointed tables (same instrument) if I glue small square plates of pine, about nine for each table, on the centre join, so as to strengthen it, will it have any influence, good or bad, on the tone? The tables have never had them on before. (3) Is it necessary to have the grain of the wooden plates placed in any particular direction to the centre join of tables?

Waterproofing Cloth.

D. D. (*Bala*) writes :—"Can you supply me with a recipe by which cloth can be made watertight, or can you give me any mode of making fishing stockings?" [Your letter was sent to a gentleman for reply, but he states that his recipe for waterproofing, is not strictly speaking a *waterproof* but a *repellant*, and though well suited for an overcoat, would not withstand the great pressure required for fishing stockings, so I put your query under "Information Sought," in order to elicit the required information for you, if possible.—Ed.]

Stereotyping.

Twist Drill asks :—Can any amateur tell me how to get a stereotype of a few lines of type. I have heard that the mould can be made of paper; but, if so, how?

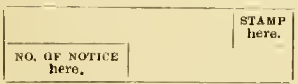
SALE, PURCHASE, OR EXCHANGE.

Persons availing themselves of this Department of Amateur Work *are requested to note that—*

(1) *No Trade Advertisements can be inserted in this Department, which is open to boná fide Amateurs only. The Editor reserves the right of refusing to insert any notice.*

(2) *No charge will be made for the insertion of notices until their number be such as to render it absolutely necessary to do so.*

(3) *Persons writing in reply must forward application under cover to the Editor, in an envelope sealed down, with a Penny Stamp attached in the upper right hand corner, and the* Number *of the notice in the lower left hand corner thus :—*



(4) *Letters thus marked and enclosed under cover to the Editor will be forwarded immediately to owners of articles for Sale or Exchange, or persons wishing to purchase. No attention will be paid to any communications in which these Rules are not strictly observed.*

(5) *It is desirable that those who reply to notices in this Department should enclose to the advertiser, with their application, a stamped and directed envelope, in order to ensure a reply. When this precaution is not taken, the non-receipt of a reply within reasonable time can only intimate that the article in question is disposed of, or that the proposal made is declined.*

527. **Carpenter and Builder**, 2 vols., 1880-82. Newly bound in half-calf, perfect condition. Will exchange for anything useful. (*London, S.E.*)

528. **Small Printing Press Wanted.**—Good exchange offered. (*London, S.E.*)

529. **Photo Camera**, Lancaster's, Merveilleux, or Instantograph wanted, with appliances complete. Good exchange offered. (*London, S.E.*)

530. **Books, Various.**—(1) Cassell's Encyclopædic Dictionary, Vol. I, unbound; (2) Amateur Work, Vol. III, bound, cost 7s. 6d. Will sell for half cost price, or what offers? (*London, N.*)

531. **Opera Glasses and Telescope.**—Glasses cost 9s., Telescope, 14s. Will sell for half cost price, or what offers? (*London, N.*)

532. **Fifty inch Bicycle**, Singer's Challenge, strong and in good order, with lamp, and all complete. Price £4 10s., or will exchange for $3\frac{1}{4}$ inch Magic Lantern, with Slides, comic or otherwise, a large sized American Orguinette, or a Harmonium. Failing these, what offers? (*Airdrie.*)

533. **Books, Various.**—(1) Carpenter and Builder, illustrated, 6 vols., 10s.; (2) Russo-Turkish War, 2 vols., well bound, 10s.; (3) Pictorial World, 4 vols. (11, 12, 13, 14), 15s. All carriage free. Or will exchange for good $\frac{1}{2}$-plate Photo Apparatus, giving some cash. (*Belfast.*)

534. **Parts of Model Engine.**—For Sale, complete set of materials (except bed plate) of Model Horizontal Slide Valve Engine, 1 in bore, 2 in. stroke, cylinder and valve box fitted complete, bearings, eccentric, connecting rod, crank, shaft guide, and flywheel. Are turned, merely want finishing off. Price 9s. per Parcel Post paid. (*Hull.*)

535. **Lithographic Press**, Waterlow's Patent Autographic, cost about £10. Will sell for £5, or exchange for first-class Fret Machine. (*Blairgowrie, N.B.*)

536. **Mitre Machine**, Booth Brothers', with extra knife, will cut 2 in. moulding, and in perfect condition. Cost 21s. Will sell, and pay carriage, for 12s. 6d. (*Blairgowrie, N.B.*)

537. **Books, Various.** — (1) Amateur Work, from Dec., 1883, to June, 1885; (2) Every Boy's Annual, 1881; (3) Some Works by Kingston and Ballantyne. What offers in cash? (*Dublin.*)

538. **Hand Fret Saw**, with Drill and Cutting Board, in good order. What offers in cash? (*Dublin.*)

539. **Indoor Aviary for Canaries.**—About 5 ft. high, 5 ft. long, and 18 in. deep. Front and sides made of galvanised wire, with four compartments. Pitch pine movable back in excellent condition. Made by Billett. Price £3, cost £7. (*Ryde.*)

540. **Mule Bird.**—Grand red-faced dark jonque Goldfinch and Canary Mule, 1884 bird, good songster and very handsome. Price 10s. 6d. (*Ryde.*)

541. **Canary.** — Very handsome, large, graceful. Wing and eye marked, Norwich and Belgian, 1884 Cock Canary, from a prize bred Norwich cock and imported Belgian hen. Fine songster, in excellent condition. Price 15s. 6d. (*Ryde.*)

542. **Electric Telegraph**, by Dr. Lardner, new and in perfect condition, cloth gilt, 100 illustrations, free for 1s. 1d. (*York.*)

543. **Corner Cramp for Picture Frames**, by Booth Brothers, new and in perfect condition, post free for 1s. (*York.*)

544. **Carpenter's Tools.** — Saw, cost 2s. 6d., offered for 2s.; Bench Vice, slightly damaged, but easily repaired, cost 4s. 6d., offered for 3s. 6d.; or both together, 5s. (*Wellington, Som.*)

545. **Conjuring Tricks**, some nearly new, about £6 worth. Wanted in exchange Printing Press and Type. (*Manchester.*)

546. **Pocket Revolver**, Six Chambers, pin fire. Will exchange for Double Combination Portrait Lens, or other approved photographic appliance. (*Fraserburgh.*)

547. **Parts of Organ.** — Windchest and Soundboard, containing 4 sliders, viz., 2 sliders, Tenor C to F^3, 1 Bass slider, CC to B, 1 slider, CC to F^3. It is made with 54 channels, and complete with pallets, backfalls, etc. Bellows, size about 4 ft. long and 1 ft. 6 in. wide, with double feeders and safety valve. Windtrunk connecting the bellows with the soundboard. Keyboard, compass CC to F^3, 54 notes. Set of Paper Open Diapason Pipes, Tenor C to G, with extra top octave, 56 pipes, and Stopped Diapason, Bass, 12 pipes; all made according to instructions in Volume II. As some of the above want a little repairing, will take £3 for lot, carriage paid. (*London, S.E.*)

548. **Revolver**, Colt's, 8 in. long, good as new, five chambers, little over $\frac{1}{4}$ inch bore, full flask of gunpowder, 300 percussion caps, 264 conical lead bullets and 138 round. Two bullet moulds, turnscrew, cleaning rod, box with lock, and lined with green baize. Cost £5. Will take £4 10s. from immediate purchaser, who is to pay carriage. (*Limerick.*)

549. **Small Printing Press** wanted, with Type. (*London, W.*)

550. **Photo Lens.**—Wanted, a Dallmeyer W. A. View Lens, 12 in. focus. (*London, W.*)

551. **Type Writer.**—Wanted, Columbia or Remington Type Writer. Approval first. (*Bournemouth.*)

552. **Electric Lighting.**—Wanted, Electric Light Apparatus, complete; 50 incandescent lamps. (*Bournemouth.*)

553. **Printing Plant.**—Complete Printing Office, cost about £85, for Sale or Exchange. What offers? (*Bournemouth.*)

554. **Books for Village Library**.—Child's Own Book, Masterman Ready, Volumes of Chatterbox, and other books suited for Village Boy's Library. Must be cheap, and the letterpress perfect and in good condition. State of binding not so important. (*London, S.W.*)

555. **Great Industries of Great Britain.**—Vol. I. (bound) of Great Industries of Great Britain, and first Five Nos. of Vol. II. Price 5s. 6d., post free. (*Walthamstow.*)

556. **Pistol.**—Wanted, a 4-Barrel or 2-Barrel B. L. Pistol, ·577 gauge. (*London, W.*)

557. **Amateur Work**, Parts 1 to 35, inclusive. Clean and perfect. Will take 10s. Purchasers to pay carriage. (*Ballymoney.*)

558. **Printing Press**.—Squintani's No. 1 Model Printing Press, prints $5\frac{1}{4}$ by $3\frac{1}{4}$, speed over 1000 per hour. In good order, price £2. (*London, E.*)

559. **Castings for Small Dynamo or Motor** (suitable for driving small lathe or sewing machine), easy to put together, Siemen's armature, price 5s. (*Manchester.*)

560. **Book Exchange.**—Work on Model Yacht Building offered in exchange for Every Man His Own Mechanic, complete, and in first-class condition. (*London, N.*)

561. **Parts of Organ.**—Soundboard, Windchest, complete with frame and backfalls, made according to Mr. Mark Wicks's instructions, Specification No. 1, with pine and mahogany. Also 44 Stopt Diapason Pipes, from Tenor C, and 42 Flute, from Tenor C. No time to finish, will be sold very cheap. (*Banstead.*)

562. **Pair of Spats**, by Watkins, *Dublin*, bran new, too small for owner. Price 5s., post paid. Size, 8. (*Dublin.*)

563. **Photo Lens and Appliances.** — Wanted, a good Carte Lens, Dallmeyer's or Ross's preferred. Also Interior and Exterior Backgrounds. Good exchange, or cash, if cheap. (*Horsforth.*)

564. **Double Stereo Camera and four Lenses**, by Ross, for sale or exchange. (*Horsforth.*)

565. **Botanical Microscope**, by J. H. Steward, quite new, including 3 powers, live box, water box, forceps, six prepared slides, etc., in case complete. Cost 15s. 6d., will take 10s. 6d.; or what offers in exchange? (*London, E.*)

566. **Achromatic Telescope**, nearly new, cost 7s. 6d., will take 5s.; or what offers in exchange? (*London, E.*)

*** **List closed June 3rd.**

COMMUNICATIONS AWAITING REPLY

Amateur Piano Maker.—Your letter was sent to Mr. Conolly, but as yet he has sent no reply. You may lead a horse to water, you know, but you cannot make him drink.

J. S. G. (*Chesterfield*). — Kindly write again; your letter was sent to the proper quarter, but has disappeared in transit apparently.

These have been sent out for reply:—Gamba; A.F.S. (*Dresden*); Anxious; D.T.S. C. J. N. (*Upper Clapton*); Chopper; Loco (*Sohagpur*); G. J. B. (*Poplar*); R. S. (*Birmingham*); J. W. H. (*Cleveland, Ohio*); S.W. (*Coleshill*); Screw and Quill Driver; J. T. (*Exeter*); W. A. D. (*Finsbury Park*); H.D.D.; A. B. (*East Grinstead*); Perfect; W. C. H.; Ebonite; J. F. (*Brixton*); G. E. G. (*Brixton*).

The "White Lily" Mantel Piece.

a Design in Fretwork by W. A. Fox.

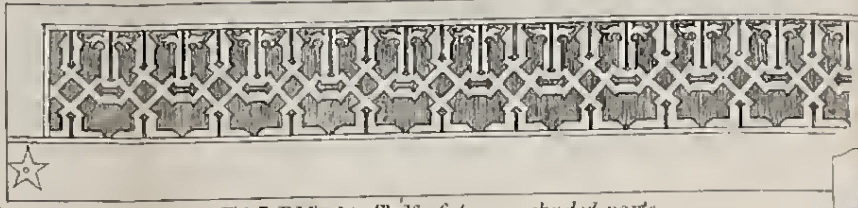


Fig 7. Edging to Shelf. *Cut away shaded parts*

Fig. 5. Bracket
Cut Four of these

Fig. 6 Alternative Bracket
Cut Four of these

Fig. 3. Panel above Jamb *Cut away shaded parts leaving white.*
Cut two of these

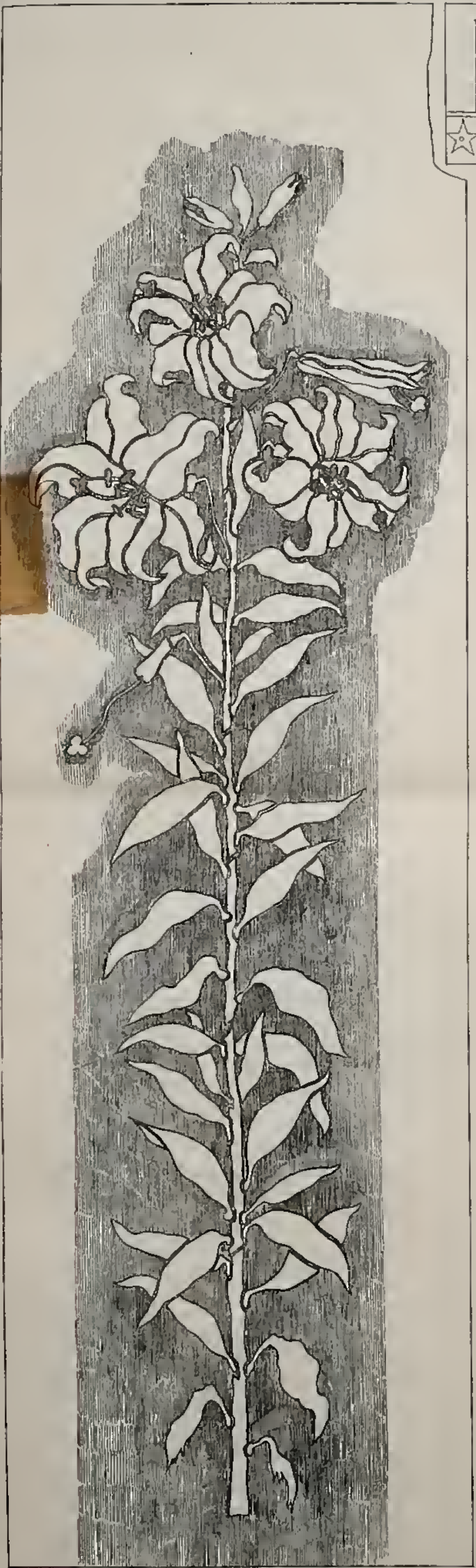


Fig 2. Design for Panel.
Cut away white, leaving shaded parts.
Cut Two of these.

Fig. 8.
Mantel Piece
when
Complete

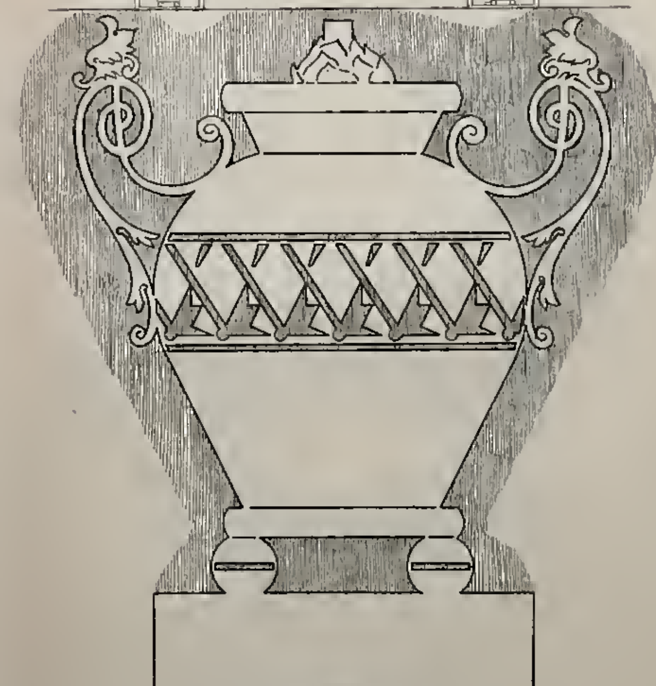


Fig. 1. Plinth of Jamb.
All shaded parts & lines to be cut out.
Cut two of these

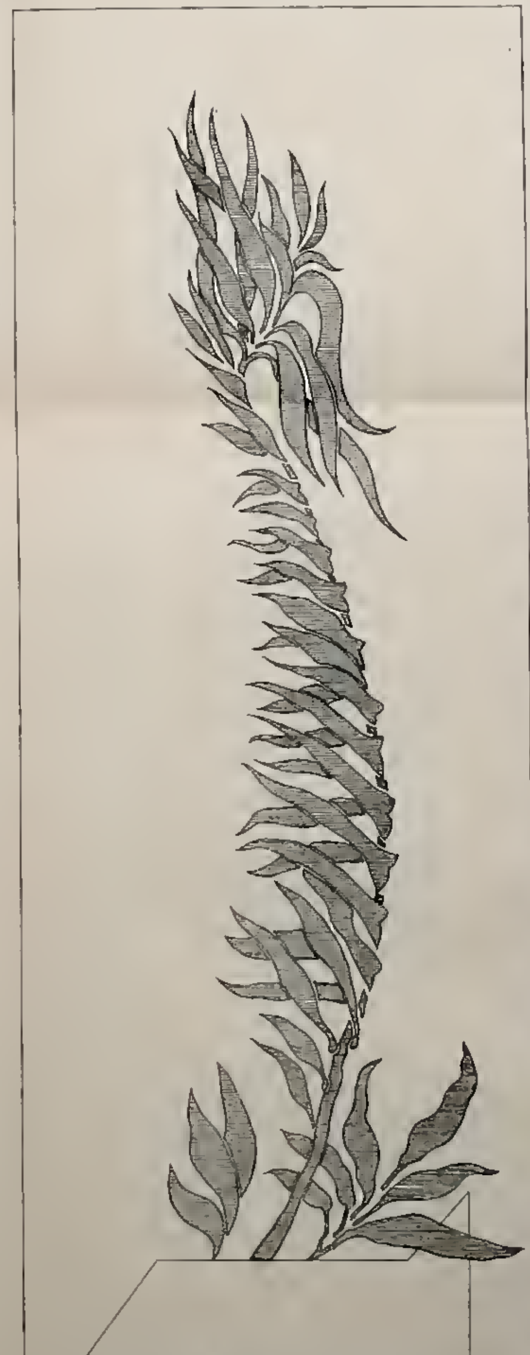


Fig 4. Half of Architrave.
Cut away Shaded parts, leaving White
Cut thus as given, & in reverse

WARD, LOCK, AND CO., WARWICK HOUSE, SALISBURY SQUARE, LONDON, E.C.

A PORTABLE WATER DISTILLERY FOR PHOTOGRAPHERS.

By C. C. VEVERS.

An amateur usually finds some difficulty in obtaining distilled water for his chemicals, owing to the rather complicated apparatus required, the weight of the same, and the large amount of room it fills up. The directions given below are for a simple, and comparatively easily made, piece of work, moderately light, portable, which takes up as small space as possible. Of course, it is not intended to distil a large quantity of water, but still it should be as much as anybody would require at one operation.

Cut a sheet of good strong tin, or zinc, which will do much better, about 24 in. by 15 in., and make a hole about the middle of the sheet and 6 in. from the side, ½ inch diameter (Fig. 1). Out of a piece of thin tin make a kind of funnel (or one can be bought for about 6d.), about 2 in. deep (Fig. 2), and a tube, 6 in. or 8 in. long by ½ in. diameter, and fix it on to the funnel (Fig. 3). Now solder the narrow ends of your piece of tin well together—so as to make a cylinder 15 in. high and about 8 in. diameter; pass the tube through the hole in the side, leaving the funnel as near the middle of the cylinder as possible; the tube should then protrude about 2 in. at the outside of the cylinder. Here fix with solder, and make watertight. Make a bottom out of your stout tin, and solder carefully on to the end farthest away from the funnel, etc. That done, make a cone-shaped lid, 9 in. diameter at the top, which is done by taking a circular piece of tin (thin will do) 12 in. diameter, and cutting a piece out 7⅝ in. at the edges and meeting in the centre. (Fig. 4 will explain better than words.) Then lap one part over the other, just 1 in. at the edge, solder, and make watertight. This is intended to cover the cylinder, and should hang 5 in. from the top—in fact, the tip of the cone should stand directly over the mouth of the funnel.

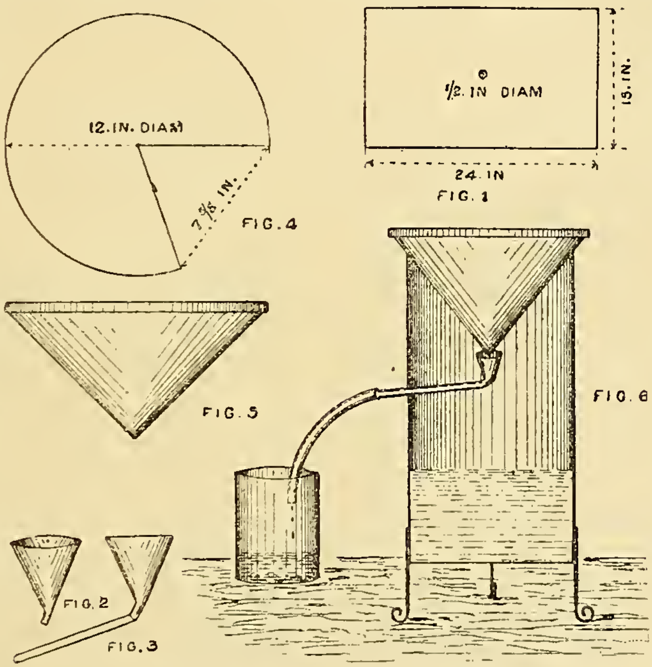


FIG. 1.—METAL SHEET FOR CYLINDER. FIG. 2.—FUNNEL. FIG. 3.—TUBE TO FIX TO BOTTOM OF FUNNEL. FIG. 4.—PATTERN OF METAL SHEET FOR CONE. FIG. 5.—CONE TO FIT INTO TOP OF CYLINDER, COMPLETE. FIG. 6.—SECTION OF APPARATUS WHEN FINISHED AND AT WORK.

The only thing now required is a piece of rubber tubing—any length that suits—which fixes on to the tube projecting from the side of the cylinder. Your apparatus is now complete. (See Fig. 6.)

To use: Pour about a quart of tap water into the cylinder, fix on the top so that no steam can escape, and fill the cone with *cold* water. Heat to boiling with an ordinary gas-stove or spirit lamp. The steam rises and settles on the cone, where it is condensed by the cold water outside; it then trickles down, drops into the funnel, passes down the tube, and is caught in a dish or bottle placed for the purpose at the other end.

To some people the making of the above would be impossible: to those I say "any tinplate worker with ordinary ability will be able to make one for a few shillings." Possibly he may, at some time or other, have made — under the rose, of course—a somewhat similar apparatus *for a rather different purpose!*

After use, and before putting the apparatus on one side, everything should be rinsed out, cleaned and dried, especially the cone top, funnel, and tube, to free it from any dirt or chemicals which may have collected there, as the slightest adulteration of the (supposed) purified water might seriously damage any solution of which it is a part. For instance, hyposulphite of soda in the silver bath would make it useless. A cheaper still (though not so effective as the above) can be contrived by using an ordinary kitchen tin stew-pan in place of the cylinder. It is made on the same principle as the one just described, only in place of the tin funnel and tube of the above, a long clay tobacco pipe is used. Lead should be very sparingly used in making the apparatus, as it is very injurious to the chemicals.

FISHING TACKLE:

ITS MATERIALS AND MANUFACTURE.

By J. HARRINGTON KEENE.

IX.—FLY-MAKING IN ALL ITS BRANCHES.

AS fly-fishing is the fine art of all angling, so fly-making is the fine art of all tackle manufacture. From the tiny quilled gnat, in use in the Hampshire streams, costing perhaps a penny, to the gorgeous Shannon salmon fly, worth say 5s., the demands on the maker's taste, knowledge, skill, and manipulative deftness are great and ever-varying. Yet, if the reader have mastered what has been said in reference to coarse fish tackle in preceding chapters, the difficulties are not insuperable. The art of fly-dressing is a most beautiful one, and more than repays the care of the amateur as he goes along creating things of beauty: moreover, it grows on his inclinations; and I personally know several gentlemen, and even *ladies*, whose spare time is filled up most agreeably—and to their own profit, be it said—by fly-making. Ay! and their flies outshine in some particulars even the finished productions of professionals, especially in faithfulness to nature; for, of course, trout flies in all cases should be as nearly as possible imitations of the insects on which trout are known to feed. The salmon fly is, of course, *not* an imitation; rather let us term it a poem of colour, the beauty and efficacy of which will vary with the taste and creative skill of the maker.

It seems scarcely credible that, notwithstanding the fact that fly-fishing, and presumably fly-making, has been in vogue more or less for two thousand years, such scant reference has been made to it in the writings of the old-world authors. With the exception of Martial, who simply says—

> "Who hath not seen the *scarus* rise,
> Decoyed and caught by *fraudful* flies?"—

there is no one to be quoted but Ælian on the art of fly-making amongst the ancients.

In his "De Natura Animalium," this writer, however, says: "The Macedonians who toil on the banks of the Astreus, which flows midway between Berea and Thessalonica, are in the habit of catching a particular fish in that river by means of a fly called *hippurus*. A very singular insect is it; bold and troublesome, like all its kind; in size a hornet; marked like a wasp, buzzing like a bee. The predilection of the fish for this prey, though familiarly known to all who inhabit the district, does not induce the angler to attempt their capture by impaling the living insect. Adepts in the art had contrived a taking device (*captiosa quædam machina*) to circumvent them, for which purpose they invest the body of the hook with purple wool, and having two wings of a waxy colour, so as to form an exact imitation of the *hippurus*, they drop these abstruse cheats gently down stream." The scaly pursuers, who hastily rise, and expect nothing but a dainty bait, are immediately fixed by the hook. According to the "Bibliotheca Piscatoria," this passage was first pointed out by Stephen Oliver, author of "Scenes and Recollections of Fly-fishing," and I have transcribed it because it so clearly identifies the existence of the subject before us in the earliest times. Moreover, it tells of the method of using the lure—viz., "they drop these abstruse cheats gently down the stream." As the artificial fly was thus clearly a "floating fly," there is a strong similarity between this method and that pursued by anglers of to-day.

I can find nothing besides that which has been already quoted in the ancient writers referring to fly-fishing. The style of fish-capture practised by the Egyptians does not seem to have been fly-fishing, though winged insects are to be found represented on their bas-reliefs or hovering over the water of fish-pools and streams. The trident and bident—or, in modern phraseology, the fish-spear—seems to have been the favourite weapon; so that, so far as a sportsmanlike spirit is concerned, the Macedonians must have been a far superior set of people.

In consequence of this dearth of information a great hiatus occurs in the history of fly-making. Not until the first book on fishing in the English language was printed, is the subject again to be traced. The first book, the reader needs scarcely to be told, is the treatise on "Fysshynge wyth an Angle," included in the "Boke of St. Alban's, write by her prioress-ship Dame Julyana Bernes or Berness, to the intent that youre aige maye the more flowre and the more lenger to endure." This fair angler-author advises fishing for trout in "lepyinge tyme," with a "dubbe;" and at the conclusion of her treatise she gives directions for the making of twelve sorts of "dubbes for troughte and graylynge." The details of one or two of these will suffice for subsequent comparison with those I shall speak about presently. "The doone fly: the body of the doone woll (dun wool), and wynges of the pertryche (partridge). Another doone (dun) fly; the body of black woll, the wynges of the blackest drake and the jay, of the wynge and under the tayle." This work bears on the title-page of the original edition, "Emprynted at Westmestre by Wynkyn de Worde, the year of Thyncarnacon of our Lord, 1496."

So much for the history of the artificial fly. Let me now, before plunging into the severely practical

part of the subject, give the beginner one or two words of friendly counsel. First, be patient. If you do not at first succeed—well, you know the rest. Never be satisfied with inferiority; neatness is even more necessary to the appearance of an artificial fly than to that of a watch. Study nature, if possible, for the right shades; but if you are working in winter-time, obtain the best patterns from such makers as Little, of 15, *Fetter Lane*, and set to work steadily to imitate them. Select all your colours by daylight, if you can; and, lastly, but not least, keep clean and *steady* hands: by the latter I mean don't come in fresh from cricket or any violent exertion, and fancy you can tie a tiny midge with any neatness, because you will be disappointed.

Now, as to apparatus. A strong deal table, free from draughts and covered with white paper, is indispensable; a few wine-glasses, without the foot, as used by watchmakers, are also useful. Then you should have a fly-vice. A few years ago these were not used, but the increased delicacy necessary in the smaller floating flies (a term to be explained presently), really renders a good vice a very valuable aid. It is true, one of the best fly-tyers in the world—the chief at Messrs. Allcock's, *Redditch*—ties without such adventitious help; but then he is an exception. The kind I use is as Fig. 106, and is made by Mr. Ogden, of *Winchcomb Street*, *Cheltenham*, than whose father there was probably no cleverer fly-maker alive. Fig. 107 shows a different make.

A pair of sharp-pointed scissors, such as are shown in Fig. 106, are also indispensable; for, after a fly is put together it is often found that some loose fibres mar its symmetry and neatness, if left as they are. Moreover, the fine point of the scissors is necessary to clip off the whipping silk, of which, it often happens, two or three different colours are employed. A pair of spring tweezers (Fig. 108), which are easily fashioned from a length of steel wire, or can be purchased for a few pence, is also required for the purpose of attachment to such part of the flies—whether for salmon or trout—as are occasionally required to be fastened together ultimately, but kept apart during the process of making. When in use they are simply nipped on this or that feather, till the latter is required to be worked in the body of the fly.

A pricker (Fig. 109) concludes the list of apparatus necessary to the fly-tyer; and this, if the beginner chooses, is easily made at home, from a good, stout carpet needle. Its use is to tease out the fibres of the fur bodies of some flies, or to arrange the set of the fibres of the wings, etc. It is also very useful when, by some chance or other, a knot has been wrongly tied either in the whipping-silk or gut to which the hook is tied.

This instrument, then, concludes the list of apparatus, and it now becomes our task to turn to the *materials* necessary to the making of the artificial fly.

Let me, at the outset, premise that there is no hard-and-fast rule as to these materials; and it is in the selection of them that the most celebrated fly-makers excel. They may be derived from the furs and feathers of all kinds of animals—from the patient ship of the desert, the camel, to the mighty condor of the Andes. Even the scales of fishes themselves furnish capital wings for some of the daintiest of our clear-stream flies; and once and for all be it said, the taste and sense of suitability for imitation in the maker is the only guide. Of course, *generally*, I may enumerate those materials which are most in use, for the benefit of the learner; but after he has gone carefully into the processes of this delightful art, he will begin to select his materials himself, and though probably he will continue to follow the formulæ I shall give in a future chapter for the chief flies, yet he will by no means consider himself bound by them if a softer or truer-coloured material presents itself. Briefly, then, the stuffs most in use, and of which a goodly stock should be collected at the onset, are hackles from the necks of blue-dun hens, especially those with ginger-coloured edging; hackles from the necks and near the tails of game-cocks, both red and furnace (*i.e.*, tinged with black); hackles from the neck of a black Spanish cock; scapular feathers of the woodcock and grouse (of course my readers remember that "scapular" relates to the shoulder), and the brown mottled feathers of the back of a partridge. The wings of the starling are in great request for the dun flies, and a plentiful assortment is desirable; as is also the landrail, hen pheasant, and dotterel (when procurable), the grey and brown mottled feathers of the wild drake, and the herl of ostrich, and the eye feathers of the peacock. With these the tyro may make a start, but only a start; for if he, as he should, make his flies after nature, he will require delicate shades, which in some cases he will require to produce by means of dyes—which I shall enumerate directly. His "dubbing"-bag should contain everything conceivable possessing short fibres—*i.e.*, the furs of hare, rats, moles, rabbits, and all the mohairs or lambs'-worsted, etc.; silks and horsehair of all degrees of fineness and colour—the latter produced in some cases artificially. These dubbings are for the bodies of the flies, and are derived from all sources. Straw, india-rubber, and cork are also not to be forgotten; but especially should the silks be diversified and plentiful.

Now, as I promised above, I think, before proceeding to make an artificial fly with the reader, I had better give some receipts for dyeing such feathers,

etc., as, while possessing elasticity and texture, are not of the requisite shade. This often happens ; and, as an instance in point, the artificial May-fly may be mentioned. Now, the nearest feather as an imitation we possess, is that of the American wood-duck, or even our own wild drake ; but there is this difference: whereas these feathers are mottled black and white, the May-fly itself is tinged a yellowish green. Obviously, therefore, a suitable stain is here necessary. These given have in each case been verified by the writer, and are given by Mr. Alfred Ronalds, in his "Fly-fisher's Entomology" (Longmans) — a work which I advise all who seriously desire to be good fly-dressers to procure.

To Dye White Feathers Dun Colour.—Boil the feathers in a solution of alum—one ounce to pint of water for a few minutes—this rids them of their natural grease, and is indeed an excellent mordant for all feathers. Take then a pint of water and place them in it over a slow fire, adding sumach and fustic till the required tint is produced. Add copperas if a blue dun tint is required.

To alter Hackles to a Deep Brown.—Copperas size of a filbert in a pint of water, boil it, put in feathers till they appear of the proper shade. You can remove them occasionally for examination.

I spoke just now of the dyeing of the mallard, drake, or wood duck's feathers for the May-fly. This is how it is done : Boil in the alum and water, spoken of in the formula for dyeing white feathers. Then boil with fustic, subduing the brightness of the yellow with nitrate of copper. The feathers should not remain too long in the solution, or they become brittle. I find that dipping them in paraffin oil renews the gloss of which the alum and dye have deprived them.

To Stain Feathers an Olive Dun.—Make a strong infusion of the outside leaves of an onion, by allowing the ingredients to stand warm by the fire for twelve or fourteen hours. If dun feathers are boiled in this they will become olive dun in hue and white feathers a yellow. If a small piece of copperas be added, the latter colour will become a useful muddy yellow, approaching to a yellow olive dun, according to the amount of copperas used.

To Dye Feathers Dark Red and Purple.—Take Brazil wood dust and logwood infusion—the latter is of course made by infusing a handful of logwood chips in three pints of water. Immerse the feathers, and mingle the dust till the requisite red tint is arrived at. For *purple* dip the feathers in a solution of chloride of tin.

To Dye Red Feathers Scarlet.—Boil a teaspoonful of Brazil wood in a half-pint of water, simmer the feathers for half an hour in this infusion. Then immerse in a solution of chloride of tin, to which a little free hydrochloric acid has been added to increase the tone. Wash thoroughly and dry.

To Dye Red, Amber, and Brown.—Boil in alum and water, as before advised. Then boil in an infusion of fustic (two teaspoonfuls to a pint of water) till the yellow colour seems as deep as can be expected. Set the colour with a solution of nitrate of tin, in which a little common salt has been sprinkled.

Blacker, the late celebrated fly-tyer of Soho, wrote a capital little work on fly-dressing—that is "capital" to all who knew the rudiments of fly-dressing, and supremely mystifying to the completely uninitiated—and in it he gives several recipes of worth, which I reproduce here, having tried them all with success. *For dyeing feathers Blue* he recommends one to fill a pipkin with soft water, put it on a slow fire, and add a teaspoonful of paste blue. [This is out of date with most colourmen ; but a good London firm will be able to execute an order for it.] Stir it well ; when it is more than lukewarm take a teaspoonful of cold water, drop into it twelve drops of oil of vitriol, put this in your blue dye, and then put in quarter ounce of pig's wool or mohair, previously cleaned in the alum mordant. Boil it slowly for fifteen minutes, take it out with a piece of wood, and immerse in a pan of cold water. "Dry your stuff and your colour will be fine," says Blacker.

For Dyeing Feathers Red.—Here is another dye which is said to be lasting ; a statement I fully believe, for I have at this moment a red spinner fly, which has been made some years and used a great many times. Put in your pipkin water as above, boil in it two handfuls of Brazil wood with your stuffs half an hour, take it out and cool your dye with a little cold water, before you put in the oil of vitriol (quantity as before, or a little more), then put in your stuff, and let it simmer over a slow fire one hour, take it out and immerse it immediately as above; dry it quickly.

For Claret Dye.—There is considerable difficulty in getting a natural claret; a tint so essential to such flies as the Turkey Brown—a grand killer during the height of summer. Add first to the Brazil wood half the above quantity of logwood, and in the second boiling put in a piece of copperas the size of a pea, with a bit of pearl-ash the size of a nut. Boil it one hour. Cool the water, in all cases, before putting in the oil of vitriol.

To Dye Feathers Yellow.—This colour is, of course, indispensable in the manufacture of the yellow Sally. Water as above. Put in a handful of bruised Persian berries and boil them one hour, then add two tablespoonfuls of turmeric. Put in the acid and boil the stuffs—not more than $\frac{1}{4}$ oz. at a time—for half an hour. Immerse in cold water and dry. By adding a teaspoonful of Brazil wood a bright orange is procured.

To Dye Feathers Brown.—Water as before. Boil a good handful of walnut rind and a small quantity of Brazil wood and of logwood, half an hour together. Put in your mohair (or other material) cooling the liquor before the acid is put in. Boil it half an hour longer and the colour will be lasting. For a *cinnamon or yellow fiery brown* dye your materials yellow first. Add in all the above ingredients according to the amount of material to be dyed.

To Dye Feathers Black.—Water as before. Boil two handfuls of logwood one hour; add a little sumach and elder bark. Boil these ingredients half an hour, and enter your hair feathers for half an hour. Take it out, cool your liquor, dissolve a bit of copperas the size of a Spanish nut and put it in your liquor, adding a little argil and soda. Boil it half an hour; take out the materials occasionally, as the air contributes to its colour, and your black will be the colour of the raven's feather.

In addition to, and in a great many cases in substitution of, the above recipes, I must here mention Messrs. Judson's little bottles of dyes—mostly of aniline extraction. They impart most delicate shades if carefully and skilfully used. I find it is necessary to first boil in the alum solution and wash in pure water, and then preparing the solutions according to the directions on each bottle, the feathers, etc., are immersed and afterwards rinsed in clean water. They should, in each case, be tied up neatly in bunches, as in Fig. 110.

A good wax for preserving the silk with which each fly is tied is very desirable. Some fly-tyers use cobbler's wax, but this from its dark colour is highly objectionable when making small, bright, or delicate

FIG. 110.—BUNCH OF FEATHERS FOR FLY-MAKING.

FIG. 108.—PINCERS FOR FLY-TYING.

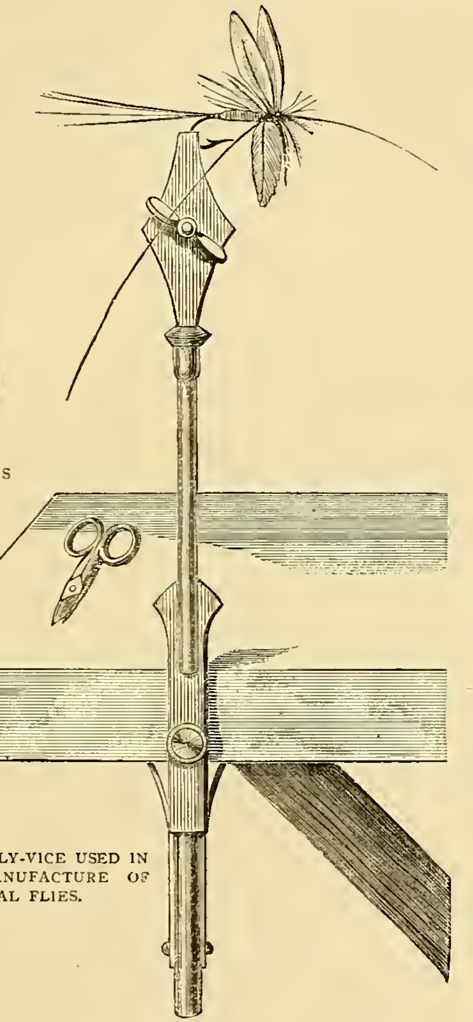


FIG. 106.—FLY-VICE USED IN THE MANUFACTURE OF ARTIFICIAL FLIES.

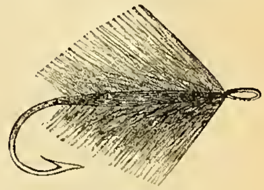


FIG. 111.—HACKLE FLY.

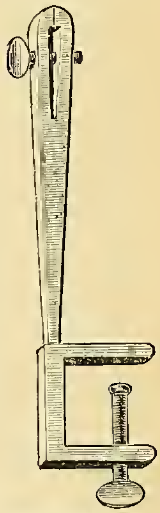


FIG. 107.—ANOTHER FORM OF FLY-VICE.

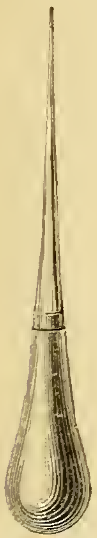


FIG. 109.—PRICKER FOR FLY-MAKING.

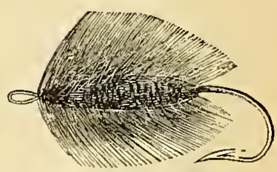


FIG. 112.—PALMER FLY.

coloured flies. I make a white wax which is almost invisible on the brightest silk, as follows: Take four ounces of the best white resin, half an ounce of fresh lard, and quarter of an ounce of white wax. Crush the resin, and let it melt well in a jar over a slow fire, stirring it all the time with a stick. Add the white wax and then the lard; let it simmer for a quarter of an hour; then pour it out into a basin of cold water, and knock it well with the hands till pliable, putting it for half an hour before the fire. It cannot be too much worked up. Cut it up in small pieces and keep in water. You have here a wax which is superior to any I have before or since I had the recipe ever worked with, and it takes the spirit varnish when you use it better than all other preparations.

I have already said that the imitation of Nature is the basis on which the good fly-dresser rests. Let the reader get Ronalds' book if he cannot get the actual insects to copy from; in it he will find capital representations of all the principal flies in use in England, with the imitation and materials of manufacture, printed in colours. Of course, in this series I can only carefully detail the processes by words, which howsoever well done, are inferior to a lesson in fly-tying by a competent hand. The exclusiveness of the tackle trade, however, precludes the latter. I once offered five pounds for a lesson or two in salmon fly-making and was refused, and therefore the beginner must give his best attention to what follows. I shall first direct his attention to the making of a simple "hackle" fly, which, in itself, is not an imitation of any particular insect, but is probably supposed to represent a fly buzzing on the water. By way of explanation I may say that a "plain hackle fly" is one made by twisting a hackle of almost any colour round the shank of a whipped hook securing it at the bend end. Here, however, is a detailed account of its making: Fix your vice securely by its clamp on the table, and place in its jaws a medium-sized hook, let the bend of the hook be to your left, and the end of the shank to your right hand, the back of the shank being upwards. Take your waxed silk in your right hand, between finger and thumb, and with your left pick up a link of gut. Crush the end of this for some quarter of an inch between the teeth, that the uneven surface thus produced may be held the tighter by the waxed silk. Place the gut in position *under* the shank, and holding it and the end of your silk firmly, rapidly whip the hook and gut together with the right hand, taking three or four turns, according to the length of the hook shank. Take one half hitch, and you have now accomplished the first operation in all fly-tying—namely, the attachment of the hook to the gut. Now take your hackle feather, and having stripped it of the downy fibres on each side of the quill down to its root, place it against the shank of the hook on the side nearest you, with its root pointing towards the bend of the hook; then, and in the same direction whip the silk three times sharply round the hook, gut, and root end of the feather, and cut off with your scissors any point that may remain. Having done so, take the feather by its point, between the thumb and forefinger of the right hand, and wind it in close laps five or six times—the number to be proportioned to the size of the hook and fly—down the shank towards the bend; then make two laps of the silk over the point of the feather. Cut away with your scissors what remains uncovered by the silk of the point of the feather; and, lastly, waxing your silk afresh, fasten it with two loops, or invisible knots, just where the bend begins, or opposite the barbed point of your hook. During these operations the silk should be kept well waxed. Fig. 111 indicates the appearance of this your first artificial fly. Make at least a few dozens of these, until you can finish neatly and quickly.

The next step in Tackle-making is the manufacture of a palmer. Now the prototype of a palmer is not a fly, but the larva of the *Arctia caja* moth, and a frequent visitor of our gardens, where his black and ruddy brown furry coat makes him easily known. It will be observed that the hackle fly is without a distinct body, whereas the palmer has one. Shipley has some capital directions for this fly made in several different ways, and I quote his capital instructions referring to the red palmer. The first operation—namely, that of whipping your silk round the hook and afterwards round your silk and gut, is performed according to the instructions given as to the making of the hackle fly. Then take your hackle feather, prepared and placed as pointed out, and lap your silk once round it and the shank. Place the thick end of your herl—for in making this fly a peacock's herl should be used—by the side of your hackle and whip your silk round the herl, hackle, gut, and hook two or three times, according to the size of your hook and intended fly. Then cut the thick ends of your hackle and herl off, wax your silk anew, and lap the herl five or six times, each lap close on the other, towards the bend of the hook. Hold your herl tight between the left forefinger and thumb towards the bend of the hook, then taking the point of the hackle feathers in your right hand fingers, and wrap it thickly five or six times over the herl in the direction of the bend. Make two laps of your silk over all, cut away the remaining point of the hackle feather, then wrap your herl farther on towards the bend twice round the hook; make one lap of silk over the herl, fasten and cut away all that remains of it. Then you have your palmer (Fig. 112).

(*To be continued.*)

AN AMATEUR'S WORKSHOP AND ITS FITTINGS.

By J. E. R.

TO amateurs who are in want of a small and compact, but yet complete, workshop, this description, I trust, may be of use.

To begin with, I intend to describe this "workshop and its fittings" as plainly as possible; and in order to take up as little space as I can, and at the same time to put it in the power of any one to make the same without trouble, all descriptions and measurements will be given in the fewest possible words and figures.

1st. The advantage of this workshop is, that any one, having only a small garden or back yard (so long as there is room to be able to walk round it, to nail the weather-boards up) can fix it up, and as it is *not* fixed into the ground in any way, it can be moved, or, when the lease is up, be taken to pieces and away. The "amateur's workshop," when finished, is very firm and strong, the stays X, Y (Fig. 2), and W, Z (Fig. 3), at one end and one side, are quite enough, as the weather-boarding, match-boarding, and also the two benches, all help to make it a solid mass.

2nd. Only just such tools as one must have find a place in this "amateur's workshop," and I think that, no matter what work the amateur may want to do (unless it be very large heavy work), he will find every tool to hand to work with. At the same time, everything *must* be kept always in its place; and, as there is a place for everything, I trust whoever builds an "amateur's workshop" by the help of this paper will always be able to find any tool he may want, even in the dark.

3rd. Most of the tools are of American make, and from Churchill and Co.'s, which are much the best tools for an amateur, I think, and I have had great experience of all sorts of tools. I may here add that the lathe and fret-saw here named and shown is from the Britannia Company, at *Colchester*, but greatly altered and improved, as, made the way they make it, the fret-saw is of very little use except for very thin wood. The fret-saw, to be of any use, must work from under the work, and there must be a spring above the work, *not* spring under and working part above, as they make them. I cannot here (in this paper) show the working of the fret-saw, but can only add that the saw is pulled down (*not pushed*), and that the working bar that does this is under the bench, but hid by small drawer in south plan under lathe. But you can have any lathe, etc., etc., placed here, the small one in "Every Man His Own Mechanic," pages 270 and 273, would do well. I may here remark that *every* amateur should have this book. I took it in when it first came out in monthly parts, and I began to make my workshop when I had got as far as the third monthly part, and have always found it a most useful book to refer to; and, as I shall refer to this book throughout this description, I shall only after this refer to it thus, "E. M. O. M.," page etc., etc., to save space and continual repetition.

Description of Plans (*Outside*).—Scale, $\frac{1}{2}$ inch to 1 foot. I have built my "amateur's workshop" north and south, so I shall call the sketches by their respective positions. I think the illustrations of framework (Figs. 1, 2, and 3) speak for themselves, and need no other description than this. The battens do not show, so they are left in the rough, the match-boarding and weather-boarding covers them. The battens are $2\frac{1}{2}$ inches by 3 inches by 6 feet 6 inches. Length of "amateur's workshop," 8 feet; height, 8 feet; breadth, 5 feet 6 inches. I began by levelling a small piece of garden only with a rake, then beat down the earth a little and put on some cinders about an inch to two inches thick, to keep weeds and worms from coming up after the house is built. Then I got from our station-master at ——— three old railway sleepers (B, B, B), at 1s. each, and placed them on the cinders, and used these, and these *only*, for my foundation—and first-class have I found them to answer. The battens, A, are nailed to the sleepers, or screwed with greased screws if you should ever want to move your "amateur's workshop," and so must the floor-boards (D) be screwed or nailed as you may wish to the joists, C. The floor-boards are 1 in. thick, the weather-boards $\frac{3}{4}$ in., and matchboards (inside) $\frac{1}{2}$ in.; for price, see "E. M. O. M.," p. 59. The four corner uprights (battens) are 3 inches by 3 inches, all the others are $2\frac{1}{2}$ inches by 3 inches, thus making a space of 3 inches all round between match-boarding (inside) and weather-boarding outside; this keeps the "amateur's workshop" cool in summer and warm in winter. The canvas roof I was obliged to add, to keep the wooden roof cool, and it makes the house, when finished, look very well. The canvas is good cheap striped stuff, not very thick, but two yards wide; it stands summer and winter well. It is only tin-tacked on to the light frame, 1 inch by 1 inch, nailed to the roof. The battens are all nailed or screwed to the sleepers *after* the frame work is fixed together. For the halving, notching, and mortising and tenoning the battens, see "E. M. O. M.," pages 185 and 187. Next the floor-boards are nailed or screwed to battens. Then nail on the weather-boards all round, beginning at north side, next west, south, and east. The roof, made of boards 6 in. by $\frac{3}{4}$ in., is tongued and grooved. Nail one board on one end of the roof (west end), and then paint the groove with some good lead colour, then fix the next board in place, and so on, leaving ends of boards at eaves all

uneven. Next run the paint-brush down each joint (one by one), and nail on while the paint is wet, a strip of wood (which had also better be painted on under side) 2 inches by $\frac{1}{2}$ inch down the joint, this makes the roof quite weather tight. After this cut along the eaves with a saw, from above, to make all the ends of the roof even. Then a small zinc gutter, not shown in plan, is put along each eave. For the cap over

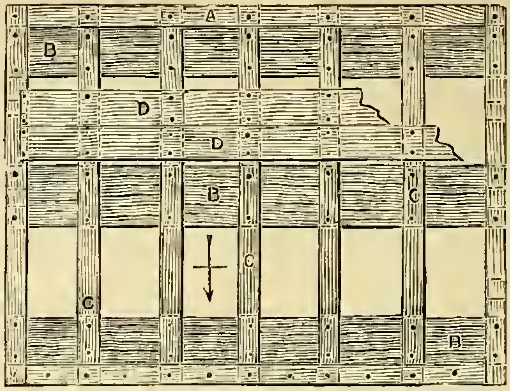


FIG. 1.—PLAN OF FLOOR, ETC., OF WORKSHOP.
A, Position of Casement Window.

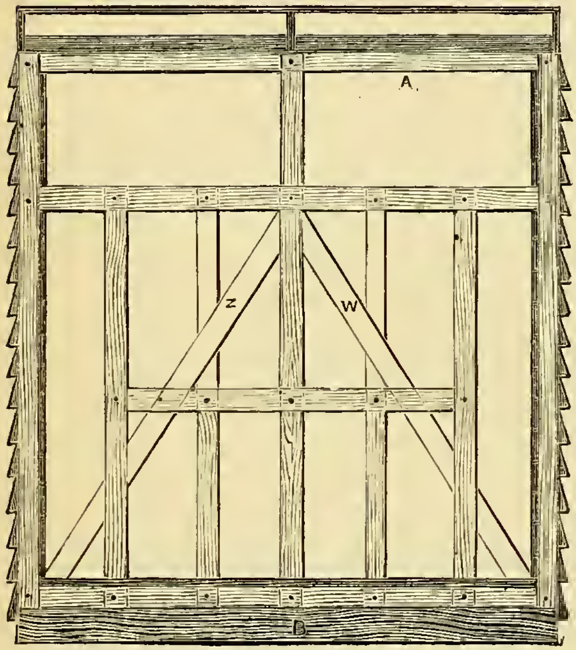


FIG. 3.—ELEVATION—FRONT (SOUTH), AND BACK (NORTH).

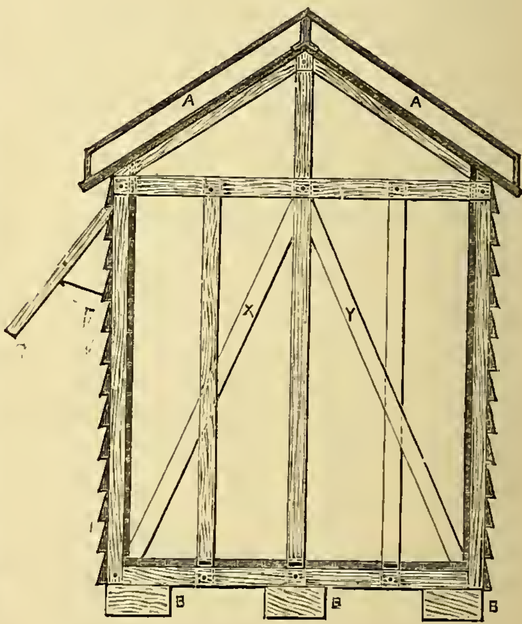


FIG. 2.—END ELEVATION (EAST AND WEST).

ridge of roof, see "E. M. O. M.," page 613.

For casement window, see "E. M. O. M.," page 379; rack for ditto, page 378; and for door, see page 385. Door opens *out*, to give room. Of course, the roof might be slated; but this makes it more expensive, and not such nice work for an amateur, and I think the house would be hotter.

I have added to my "amateur's workshop" a porch of trellis-work, see "E. M. O. M.," page 61, and an external sunshade, "E. M. O. M.," page 331; but I do not show these in the drawings, as each will have to make them to suit the different ground and room they have to build on. My house is painted dark green outside, the windows white; the roof slate or lead colour. Good American spring lock on door, 7s. 6d. only, and flat

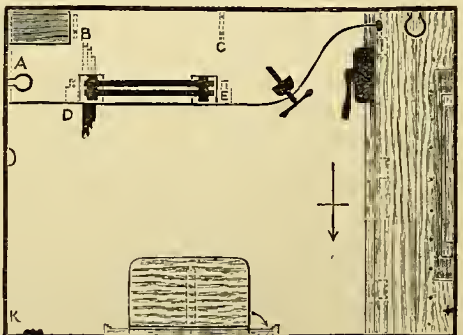


FIG. 4.—INTERIOR PLAN, SHOWING POSITION OF BENCHES, ETC.

key. Here ends the description of the outside, and I trust it will be understood.

Description of Plans (Inside).—Scale, $\frac{1}{2}$ inch to 1 foot. After all the outside is finished and painted, glass in, etc., etc., we will begin by nailing up the match-boarding on the north side, and so round; next put some moulding round corners and along where the roof joins the sides; see for moulding, "E. M. O. M.," p. 71.

Now size well all inside, but the floor *twice*, then varnish. Now before the benches are fixed (they cannot again be moved), put down a good thick piece of linoleum *all* over the floor. This is nice to stand on, and also to keep clean. Now fix up the benches. Look at Plan No. 4. The bench for lathe, fret-saw, and vice (under window) is 18 inches by 6 feet by 2 inches, shaped as per plan, to give most room and to keep it firm. First a piece of wood is screwed to east end of house at A, then an iron bracket fixed at B and C. Then the legs D, E, are fixed up, also with iron brackets at the floor, and notched, and iron brackets to the underside of the bench. The top of the bench is made with two boards, 10 inches by 2 in. by 6 ft., tongued and grooved together, and two strips across at the legs and one at A. This, when done, is very firm, and a cheap, good bench. The carpenter's bench is just the same as the last bench, except that it has three legs, and three pieces across, and three brackets fixed opposite the legs to the battens, and a 11 inch board fixed with screws along the front to fix the vice to, etc., etc. For vice, see "E. M. O. M.," page 236; for bench-stop, page 225; and bench-knife, see AMATEUR WORK. The saw-table is at an height so that when the American mitre-box (see "E. M. O. M.," page 123) is in its place, the top of same comes level with the top of benches. For fixing the saw-table, and making the same, see "E. M. O. M.," page 343.

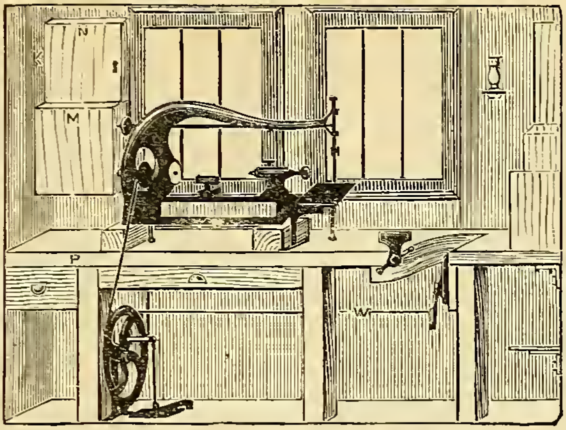


FIG. 5.—VIEW OF INTERIOR, LOOKING SOUTH.

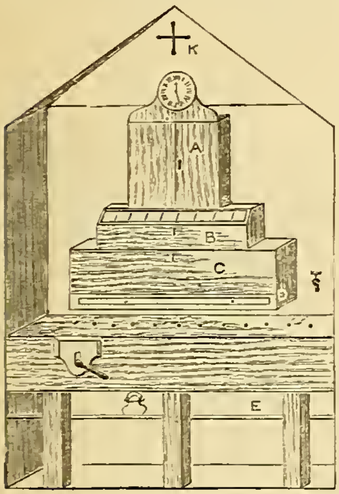


FIG. 6.—VIEW OF INTERIOR, LOOKING WEST.

The east side on plan has only the door opening out, and hinged at K.

Plan No. 5 (*South*).—Turning tools are in cupboard N, they are wood chisels and gouges, and brass and steel turning tools. This cupboard is made like two trays, only about 1 inch deep inside, hinged together at K and screwed with three screws to the battens. It has a piece of wood running across it in both trays, with holes in same for the tools to be put into, and the bottoms or backs of trays have a piece of red flannel glued on to keep the tools from rusting and to give a finish to the inside. The cupboard is black outside, with some ornamental brass nails about it, and so are all the things that are shown black in the plans. The cupboard holds from twelve to fourteen tools.

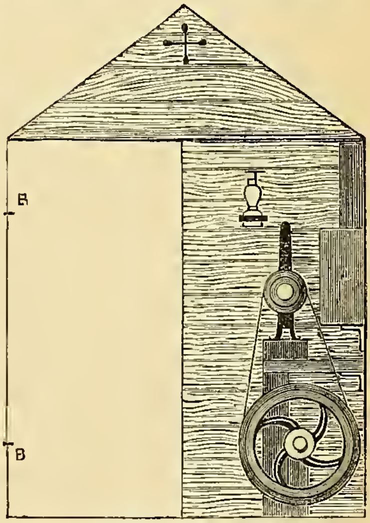


FIG. 8.—VIEW OF INTERIOR, LOOKING EAST.

The cupboard, M, under this one is only a box about 6 inches deep, and 12 inches by 12 inches, with shelves arranged inside so as to hold slide-rest (see "E. M. O. M.," page 171), dove-tail saw, circular saw spindle and

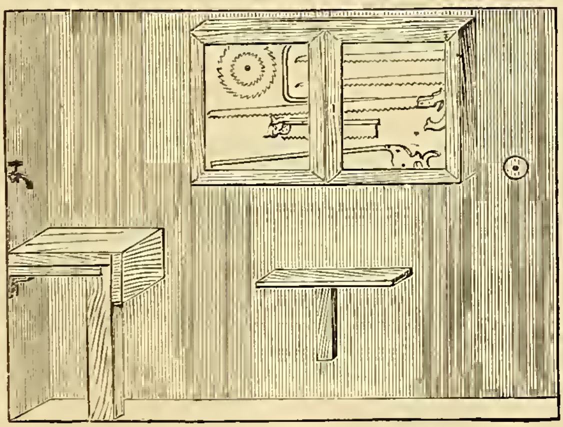


FIG. 7.—VIEW OF INTERIOR, LOOKING NORTH.

saw, back poppet, when not in use, and hand-rest; the lid is hinged at the top, at M. The cupboard has a drawer under it (not shown in plan) to put odd tools in, etc.; the drawer is only 1½ inch deep inside, and can be added or not, as may be wished.

The large drawer under the bench, under this cupboard, is 18 inches by 12 inches by 7 inches (outside), and is fitted up inside with divisions, and trays, and holes for all lathe chucks (see "E. M. O. M.," pages 260, 261, 262, 272, and others), callipers (page 265), and drills and drill chucks, lathe dog, and one of Le Count's patent expanding mandrels, price £1 5s., a centre punch, a centre gauge.

The drawer under the combined lathe, fret-saw, and circular saw drill, etc., has in it only fret-saws and pliers, three sizes, and Pratt, Whitney, and Co.'s die-stocks and taps, etc., price £2, and also a case of same, £2 2s. The drawer is only 1½ inch deep inside, and 16 inches by 12 inches, but the front goes from leg to leg to hide up the working part of the fret-saw.

Next we come to the small vice, the one I have is Stephen's patent parallel vice, complete £1 4s., of Churchill and Co.

Then, in the bend, I have one of Booth Brothers' No. 1 mitre-cutting machines, 15s., it is not shown in plan, but is placed here on a block of wood, so that the ends of the stuff you wish to cut from can be out of the window, by this means any piece can be cut, no matter what the length may be—the same with the circular saw. The wood being cut goes out of the window when over two feet long. The window gives a *good* light all over the workshop, and as lathe-work wants good light it is here placed. The lathe and fret-saw, etc., does not want any more describing, as you will place here any lathe or tool you have in its place, etc. I have shown a lamp in Plan No. 5, but I have gas and a gas stove for glue pot, etc. There is a shelf under this bench, at W, running the whole length of shop, 6 inches by ¾ inch, with a ledge in front of it to keep any odd bits of wood on, etc. The drawer under the small vice has in it all files, punches, riveting hammer, pincers and pliers, wrench, hand-vice, soldering iron, and improved surface gauge, etc.; the drawer is 3 inches deep and 10 inches by 10 inches. This ends Plan 5.

Plan No. 6 (*West*).—The bench has been described in Plan No. 4, so all I have to do now is to describe the three boxes, A, B, C, and drawer D, and shelf E.

Case or box A is made of three shallow trays like the turning cupboard, only it is made with three instead of two, and the two smaller ones (trays) shut over the larger one when tools are not in use. Here is a small plan—it has four chisels in No. 2, and also four gouges; in No. 3 it has a set of carving tools; and in No. 1 it has bradawls, and screw-drivers and some gimlets; and at the bottom of No. 2 is a foot rule.

Case B has a glass slanting top and spaces for screws and nails, and any odds and ends, brass hinges, etc. The box under the glass has divisions (two), and has in it mortise chisels and hammer ("E. M. O. M.," page 77), mortise gauge (page 115), one of Davis's spirit levels, one of the Derby bits (expansion), price 6s. 6d.

Case C has two divisions, in which are the two planes (shown in "E. M. O. M.," page 90), spokeshave (page 61), Barber's bit brace, 8 inch (see page 102, also plans, three, on page 171), two of Churchill's patent tonguing and grooving planes, price 10s. 6d. each; the lid of each cupboard, B and C, open down, so that all tools are kept just at hand and yet out of the dirt and dust. The small drawer D, under C, is the most trouble of all the fittings. Take a piece of wood ¼ inch thick by about 4 feet by 6 inches, then another the same size, but ½ inch thick. On the ½ inch piece lay all the tools I am about to name, draw a pencil mark round each tool and cut out the marks with your fret-saw; then glue and screw (from under) the ¼ inch and ½ inch piece together, and the drawer is made. Drop in the tools, and put it away.

Tools to be laid on ½ inch wood:—Universal square ("E. M. O. M.," page 114), bit (page 104), also bits (page 103), three diamond countersink bits, three small nickel-plated screw-drivers, one diamond, and space over is cut square for small awls. This ends Plan 6, except just to add that the shelf E is for wood, etc., and the tap is water laid on from house for glue, etc. The gas stove is kept on shelf E, and having indiarubber pipe can be moved any where. The ventilator at K is made round in wood, and opens and shuts.

Plan No. 7 (*North*).—Bench and saw-table have been described, so we have only saw case to think of. The case takes in all saws from the large combination hand-saw down to the small keyhole-saw—(for saws see "E. M. O. M.," pages 84, 85, 295, 665)—also the American nest of saws (three) and handle, the amateur tenon-saw, a fret-saw, and a saw-set, are all fixed on this case. The case is made thus:—A piece of brown paper is glued up on the match-boarding, then on that is glued a piece of red flannel, now round the edges, all round of this, screw to house, a piece of wood, 1 inch by 1 inch, mitred at the corners; now take a piece of picture-frame stuff, maple or any thing will do, make two doors for case, and hinge at each side of case, and put in glass, and your case is made; now screw blocks of wood for handles of saws, and put buttons to same, and the thing is done.

Plan No. 8.—This speaks for itself. There is a ventilator at top, and lamp (or gas) as shown, the door

hinged at B, B, opens out to give room. I also have a bar, $2\frac{1}{2}$ in. by 3 in., hinged on door-post on a level with top of benches, so that it shuts up and down across the doorway when open to rest wood on that (bar) and saw-table and bench, so that if you want to cut a very long piece of wood you can. The saw mitre-box that goes on saw-table is shown in "E. M. O. M.," page 123, and is screwed on to a piece of 1 inch wood, which piece of wood is clamped to table, when you wish to use it, by two thumb-screws.

You must make a trestle or sawing stool (see "E. M. O. M.," page 239) and keep it under bench. This ends my attempt to describe my workshop and fittings, and I can only add that anything that may want further explaining shall be treated in "Amateurs in Council."

THE ECCENTRIC CHUCK.

By JAMES LUKIN.

BEFORE the Eccentric Cutter was invented this was the only mode by which series of intersecting circles could be engraved upon surfaces, and the tool was a fixed one, clamped in the rest while the work was carried round upon various centres which the chuck provided. The eccentric cutter reversing the operation gives to the cutting tool the required eccentricity while the work remains a fixture, the mandrel being held fast by the index of the division plate. But with both these contrivances used simultaneously the variations of pattern are vastly extended, because the work is now shifted by the chuck into many successive positions which it could not possibly take while remaining concentric with the mandrel. It is, however, used in this case simply as the holder of the work and the means of shifting its position, and does not itself revolve while the cutter is in action. But the eccentric chuck when used by itself revolves, bringing the work variously centred by its means into contact with a fixed tool. By aid of this alone a good deal of curious and beautiful work can be done. It is not a very difficult chuck to construct, in either of two ways to be given here, as most of the surfacing can be done in the lathe by a fixed tool, avoiding thereby the difficulties of scraping and filing. In Fig. 1 is seen the chuck in front view, but with the slide down a little way to show the screw behind, by which the shifting of the plate is effected.

In Fig. 2 is seen the face of the back plate only, behind which is the screwed boss by which it is attached to the mandrel. The screw C has a turned flange, *a b*, which rests in a recess, made by a pin-drill in the edge of this plate, and then the small plate shown at C, Fig. 1, and at D secures it. D is the nut, in the middle of which a short pin stands up, and enters a hole in the back of the sliding or front plate. E, E, of Fig. 1, and G, H, of Fig. 2 are the steel bars with chamfered edges, of which R is a section; *a* being the bar and *b* the plate, with its V-groove planed or milled out. On the face of the sliding plate is a wheel of 96 teeth (I have not made 96 in the drawing), of which M is a section; *a b* is not a notch, but a circular recess, the object of it being to assist in imparting steadiness to the wheel and its screw, which is cast in one piece with the wheel, and is of the same pitch and size as that of the mandrel. This wheel and screw are bored to fit over a pin L, Fig. 2, K in this drawing being a section of the sliding plate. Sometimes it is made as M and screwed in; sometimes its base is like I, and it is then attached by three screws. It needs to be very firm, and I advise to screw it on, and then to add also the small screws.

It is over the flange of this pin that the wheel is fitted, and the recess *a b* of M, Fig. 1, is turned to fit over this flange without shake. Then the pin L being drilled and tapped, a small washer and screw secures the wheel in its place. The object of the wheel is solely to provide a division plate, and the ratchet seen at N keeps it securely; L in the plate F, Fig. 1, is a hole for a set pin. When the screw which holds the chucks is concentric with the mandrel, this hole is exactly over one in the back plate, and the pin being inserted steadies the sliding plate, and secures its position while the work is being faced ready for ornamentation. The holes and pin are made very slightly tapering. The general arrangement of the chuck will, I think, be clear to the reader, and its object is to shift the centre of the work away from its concentricity with the mandrel. The slide, it will be seen, can only be moved in one direction—viz., downwards, but the wheel adding another motion enables the new centre to take other positions. At the upper end the screw which actuates the sliding plate is squared to take the winch handle B, Fig. 1, or in its place the milled head A, which has a division plate at its lower end, which contains ten divisions, the screw itself having, as usual, ten threads to the inch. A, of Fig. 2, is a plan of a divided cylinder, seen on the screw in Fig. 1, for use when the screw is to be turned by the winch handle. Sometimes the head of A, however, is hollowed out so that the square end of the screw may project enough to allow a winch handle to be applied above it. The screw head should be kept short so far as possible, to prevent its contact with the lathe bed, or else it becomes necessary to make the whole chuck smaller, to allow the screw to run free. The chuck must, in fact,

be planned to suit the height of centre of the lathe so as to allow room for its revolution when the slide is thrown down as far as it will go, or nearly so. A chuck 3 inches in length, on a 5 inch centre lathe, will allow the slide to project 2 inches, clearing the bed by just half an inch. This is a very good guide for proportioning a chuck for any other lathe, the length being that of the height of centre, a 3 inch for a 3 inch centre lathe, a 4 inch for a 4 inch centre, and so on. A 3 inch chuck can thus throw down a slide 1 inch to clear the lathe bed, as before, by half an inch.

To make such a chuck procure castings from any lathe-maker who supplies them, and thus save pattern making. Clamp down on a face plate the back plate with the boss behind it, and turn, bore, and tap, finishing the threads with a screw tool, and then with the plug tap, which should have barely any work, its object being just to finish to standard size. Then mount this plate on the mandrel on which it is to be used, and with a fixed tool in the slide-rest face up the plate, first with a point tool and then with a round-nosed one, finishing with a flat end, or planisher, to as true a surface as possible. The slot for the screw will probably be in the casting, but if not, drill a series of holes and file it out as true and parallel as you can. Next fit out the two steel bars. The chuck will be presumably of brass or gun metal, though now and then you may meet with an iron one. Brass is usual, and then the guide bars are of steel. These must be filed up to parallelism on both faces, and then a centre line marked by means of a scriber and surface plate, or gauge of some sort, along the middle of one edge to which line the chamfers are to be accurately wrought with a file. Too much care cannot be taken to insure accuracy in this work. This central line cannot be marked until one side, at least, of the bar is perfectly levelled, and this latter must be laid on the surface plate as the fundamental plane from which to gauge the others. The apex of the bevel *must* be parallel with this plane. In Fig. 3 a slight sketch is added of the bar A on the surface plate in process of being marked by the needle or scriber of the scribing block B. There are no tools so generally useful for testing parallelism of surfaces as this, which is unfortunately expensive, owing to the extreme accuracy required in facing it with the scraper. At the same time for construction of ornamental apparatus, I cannot recommend a cheaper substitute. I have always a difficulty in stating how to cut the V-groove in the edges of the sliding plate of these chucks because a revolving cutter is the only really efficient tool, or a planing or shaping machine—the cutter being the more usual; but a file must do, if proper appliances are wanting, thin knife-edged files to begin with, and a three-square one broken off short near the point, where usually there are no teeth, as a finisher, if an angle of 60° will do, which, as a rule, it will. The broken file forms a grooving tool of the chisel or graver kind when held at a slight angle, and by lowering the hand it cuts as a file only. One secret of an ultimate fit is not to allow the edge of the bar to reach quite to the apex of the internal angle of the slide. If it does, it will prevent a good face fit. The finishing touches will be given by grinding, rubbing the two together with oilstone powder or flour emery. This, however, is literally the finish, and ought only to be depended on to get the surfaces absolutely close together after a good fit has been made by filing or other means. In a perfectly well made chuck the contact between the faces of the slide and its bars is so close as to show a mere line, and that, too, absolutely a straight one from end to end. There is one difficulty to be guarded against when the bars are made, as they usually are, with a double chamfer, and that is, that unless they and the slide are of precisely the same thickness they lift the plate, or tie it down too tightly instead of allowing it just to rest and take a bearing upon the lower plate. Made with a single chamfer like those of the slide-rest, they tend only to hold the plate down. Still a double chamfer is neater, and not, perhaps, more difficult to make. The bars should be got out just a shade too thick, and then tried and carefully scraped or filed to allow the slide to touch the foundation plate. Of course, the screw holes are to be slightly oval, and side-screws, O, P, tapped into the edge of the bottom plate. These are to be added to both bars, so as to enable the chuck nose to be set true to the mandrel. If put on one side only when they are used to tighten up the slide, it will be pushed over to one side, and the centre of rotation of the chuck nose will no longer be on the line of centres of the mandrel and back poppit. The object of making the nut D, Fig. 2, with a pin to fit a hole in the back of the sliding plate is that, so made, the screw has no tendency to lift this plate. The end *f* drops into a drilled hole to steady it.

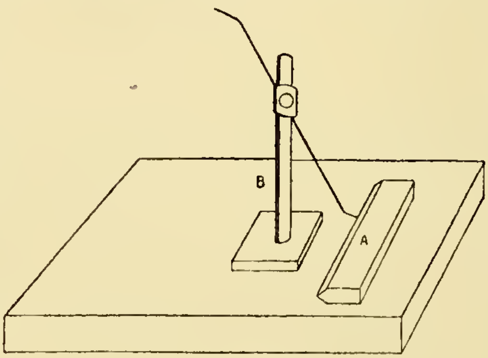


FIG. 3.—BAR ON SURFACE PLATE BEING WORKED BY SCRIBER.

I have said nothing as yet about levelling the slide; but, on the whole, I am inclined to think it is easier to turn than file it, and it is, of course, easier still to plane it. It can be held very well in a wooden chuck, turned out carefully and levelled nicely, and a little cement will still further help to hold it if necessary—Turner's cement. Warm the plate, and press it close down, and it will stand turning quite easily. When one side is finished, skin the other, which is, however, to be ultimately finished with the chuck

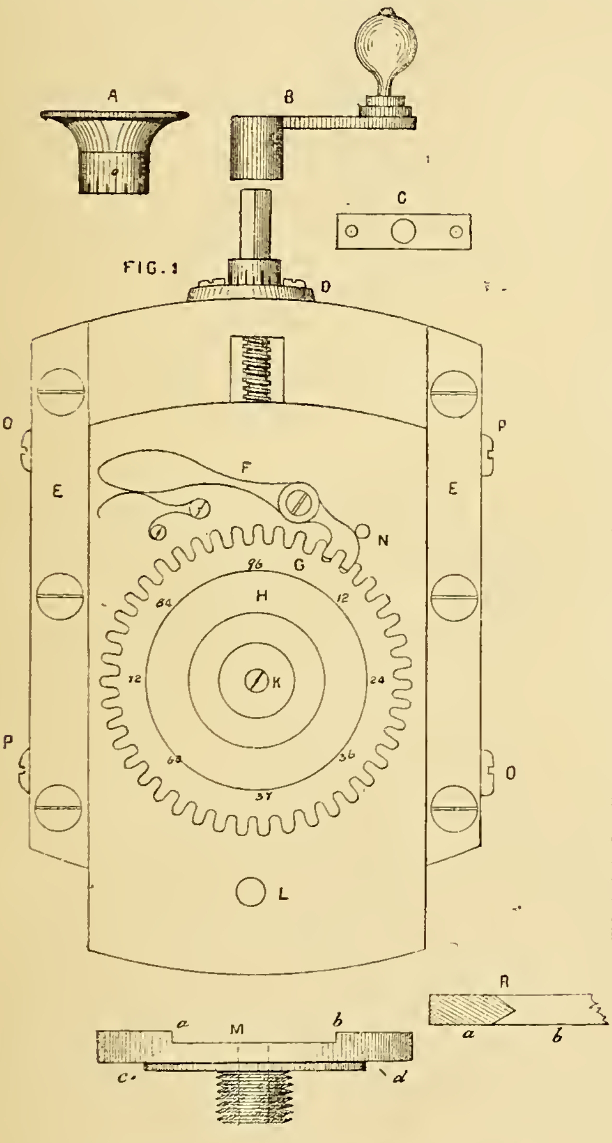
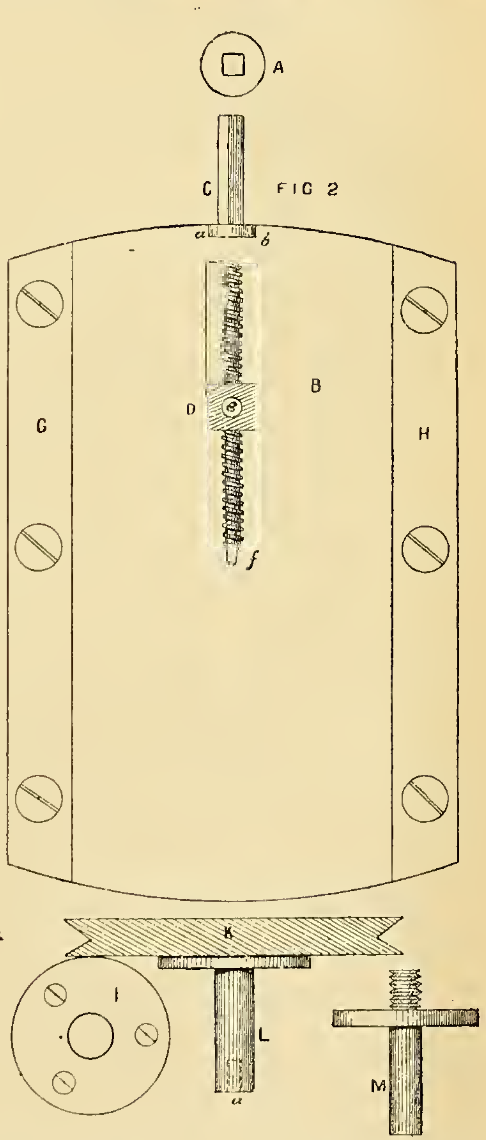


FIG. I.—ECCENTRIC CHUCK.—FRONT VIEW, WITH SLIDE DOWN TO SHOW SCREW THAT SHIFTS PLATE.

FIG. 2.—ECCENTRIC CHUCK.—FACE OF BACK PLATE ONLY.



itself mounted on the lathe, and that is to be also bored for the centre pin. This pin, again, is to be finished in its place, the back centre being brought up to assist in supporting it during the operation. It should be as large as the screwed nose of the chuck will allow, and of steel, as the chief strain will come upon it. The wheel and nose, M, cast as one, should be chucked by the nose not yet chased, and the bottom faced and the recess turned. The edge also must be turned. Another chuck must then be

taken, and the piece reversed, when the nose can also be turned nearly to size, and bored to fit the pin. But it will have to be finished in its place upon the chuck to get it absolutely true, ready for the screw thread to be cut upon it. If the amateur has no means to cut the 96 teeth, he should now get this done, and it will cost but a trifle. If he has a proper revolving cutter or mill, with a division plate and overhead, he can, of course, do it himself; but many have not a lathe fitted with these appliances for wheel-cutting.

By no means must an experiment be made of cutting the teeth with a saw and file, because the very slightest irregularity will make itself visible when a pattern is cut by its means. There is, indeed, a way of using what can often be had, viz., a clock wheel. 96 is not a necessary number to have, although convenient; but care must be taken to get an even number of teeth *experto crede.* I made a chuck in this way, and concluding the number would be even, I counted carelessly, made the affair complete, and found, when I cut the trial pattern, that the wheel had an odd number. If used, cut out the wheel, only leaving a ring of teeth, and fit it on at *c d* of M, Fig. 1. This will do as well *almost* as cutting it out of the solid; but the wheel must be out of an English clock, not a thin one like those of American timepieces. Of course the solid wheel is best, but the other plan will do at a pinch, and give good results. The nose of the chuck, and indeed all details, must be finished in its own place. In no other way can its absolute truth be insured. Turn it, and even trace the thread slightly, if you please, while it is held in a chuck, but the final correction of the thread must be when it is all put together, the safety pin being, of course, inserted to take off all strain. The click, or detent, should also be used with a pin behind, to hold it firmly down. Then the thread is to be finished by a hand-chasing tool. Its accuracy can be tested by any chuck known to fit well upon the mandrel screw. The detent is, of course, filed out of a bit of iron or steel. The steel spring must be either a bit of clock spring, or made specially; an old door lock has in it a spring which can be used for the purpose, but it is as easy to make a special one. When filed to shape, and heated and bent, heat again to bright red, and plunge in water or oil, then heat it till blue, and dip again. It should be fairly strong, but not so stiff as to make it uncomfortable for the fingers to press down the detent. I have here supposed a ratchet-wheel to be used, because it is easier to make; but nearly all bought eccentric and oval chucks are now made with a worm wheel and tangent screw—a superior arrangement, but one which needs a good deal of skill to carry out. Here, however, the aid of a professional may be called in, and the difficulty thus escaped. In a future number, however, I shall probably give directions for the work.

It is certainly within the capabilities of any amateur who could make a lathe, or even, perhaps, who could make the rest of this eccentric chuck satisfactorily, and it enables the turner to do finer tracery, because the wheel can be turned through a smaller space after the cutting of each individual circle. Still, as a first attempt at ornamental chuck-making, I think the click wheel and ratchet will present quite sufficient difficulty to test the manipulative skill and patience of the amateur. If, however, he determines to get a wheel cut and divided for him, he may as well have the worm wheel at once, as the cost will not much exceed that of the other.

PRACTICAL LESSONS IN WOOD CARVING.

By E. ARTHUR EDWARDS.

VI.—EXAMPLES IN VEINING AND GROUNDWORK—DESIGN FOR HANGING WALL CABINET.

IT must not be supposed that the methods of carving are limited to the two of which I have now treated, and we must no longer remain unacquainted with a simple variety of which great use can be made, especially when time is an object to be gained. There are occasions when the work in hand consists of several pieces requiring the aid of a practical joiner, if, indeed, there are any readers of AMATEUR WORK yet remaining so thoroughly amateurish as to be unable to put a box or cabinet together creditably; and it is an undeniable fact that these various parts cannot all be in full view of the spectator, and therefore the same amount of pains need hardly be expended upon those which are least prominent as upon their friends in front; for instance, a hanging wall cabinet, the carved portions of which consist of, say, doors, back, corners, and sides. It is within the bounds of possibility to have a different species of carving for each of these portions, and the general effect would be immensely heightened by such diverse treatment; the doors, and perhaps the back, being most prominent, should be carved in low relief, the sides might be fretted and carved, and the corners (at right angles to the doors and back) I should propose to merely *vein in outline.*

This process, it will be seen, is the natural progression from the simple veining of leaves and stalks, applied to the external forms of almost any object. It might be imagined that upon a perfectly flat surface such a simple process could not be employed with any

degree of satisfaction, but I feel confident that those who try it with the intention of persevering until the incipient difficulties are overcome, will not be disappointed with the result. A sharp tool and steady hand are essential to success, and with plenty of practice at simple forms, it is surprising what a good effect can be obtained, especially when economy of time is a consideration.

There are two ways of holding the tool, and the advantage of either of these can best be discovered by rough practice. First, more particularly for short lines, the tool should be grasped precisely after the manner of a pen, with the forefinger on the top, the thumb and second finger on opposite sides, the left hand holding and guiding the wood; second, the tool handle in the palm of the right hand, the left forefinger restraining its too eager advance. A great distinction must naturally be made between fine and coarse lines, a very gentle pressure being requisite to represent the former, and a deep bold cut to the full cutting power of the tool, the latter. When it is borne in mind that this is the only shading obtainable, it will be seen how important, in the highest degree, it is to preserve the distinction, and according as the exigencies of the case require, so, what variety is practicable must be imparted to the subject in hand.

A long stalk is partially hidden by a flower, or leaf, or crossed by a shorter segment; the underlying part must then disappear by a crescendo movement, commencing a short distance from the junction, and re-appearing (diminuendo) until the normal depth is reached; each segment of a leaf must likewise be treated so as to avoid a too stiff and flat appearance, and as in leaf veining, each cut must terminate abruptly, for instance, at the points of an ivy leaf, the lines forming the angles must not cross one another at the apex. Nothing, however, but steady practice can ensure success at this critical juncture, and preliminary attempts upon a rough specimen must be freely indulged in before an elaborate design is attempted. The leaf veins must, of course, be inserted as in ordinary carving, as all that can be done to amplify the design is most necessary; and here it will not be out of place to mention a substitute for the shorter side-veins that I frequently have used with good effect. It consists in making small incisions with 3 G or 1 G (according to the length of the vein) somewhat in this manner: having veined the mid-ribs as usual, make a cut in the direction of the side-vein to the requisite depth, inclining the tool handle *towards* you, and then by holding it in the *opposite* direction and making another cut, the vein is formed. I think, perhaps, this is an easier method for beginners than the other, and has the advantage of making a perfectly clean vein, free from scratches and other defects. So much for theory, now then for practice. We will commence with a little design, shown in Fig. 17, in the familiar, but still, perhaps, not perfect ivy; possibly some ingenious minds will be able to use it up in a job now in hand, but, at any rate, it need not be thrown away. I find these little odds and ends will generally come in sooner or later. The border line, A B D C, should be first veined, and great care must be taken to get it quite straight, and of equal depth throughout. Then comes the inner pattern, about which I trust the foregoing instructions are sufficiently explicit; and last, but not least, the stamping. Nice work in this particular is most essential; after having chosen a stamp most suitable to the job in hand (as a general rule, it should be in proportion to the scale of the pattern, a small stamp for such a one as this, and a larger stamp for a bold flowing design) it should be used with a certain amount of irregularity, but yet the whole surface should be studded. And here I wish to strongly recommend a set of stamps made by Mr. Lunt, 297, *Hackney Road;* they are made of best steel, very well cut, so as to give a fine impression, and will be found eminently useful in all relief carving. As a general rule, it is necessary to take a mallet for this work, using it firmly, but lightly, so as to get impressions of regular depth throughout, and varying the pressure only as the grain of the wood requires it. I have given patterns of several in Fig. 18, but there are others, equally useful, particulars of which can be had on application; they are priced at 1s. each.

I intend at an early date to give full designs for a hanging cabinet, embracing the various styles of carving to which I have already referred; and as the details may require more space than is at my disposal in a single article, I now give, in Figs. 19 and 20, the design for the sides, which are placed at right angles to the back, to be veined in outline and stamped. As it has been considered more useful to give this design in its full size, and not in a reduced form to scale, it has been divided into three parts, but the connection of the three parts will be easily recognized, this junction being shown by the dotted lines, A A, B B.

When the amateur carver feels that he is sufficiently advanced to discard the ivy for the more florid daffodil, I should advise him to make preliminary attempts at the design under notice, upon a spare piece of wood, so that the success of the *chef-d'ouvre* be not marred by any traces of early failure, for though these corners are not destined to adorn a very prominent position, the inquisitive eye will be sure to detect any falling off from the grandeur of the *tout ensemble.*

Before commencing to transfer the pattern to the wood, be careful to take a copy (by the aid of black

carbon copying paper) as this corner-piece is required in duplicate; the paper on which it is copied must be fairly stout, say good cartridge, as it has to stand a large amount of wear and tear. When

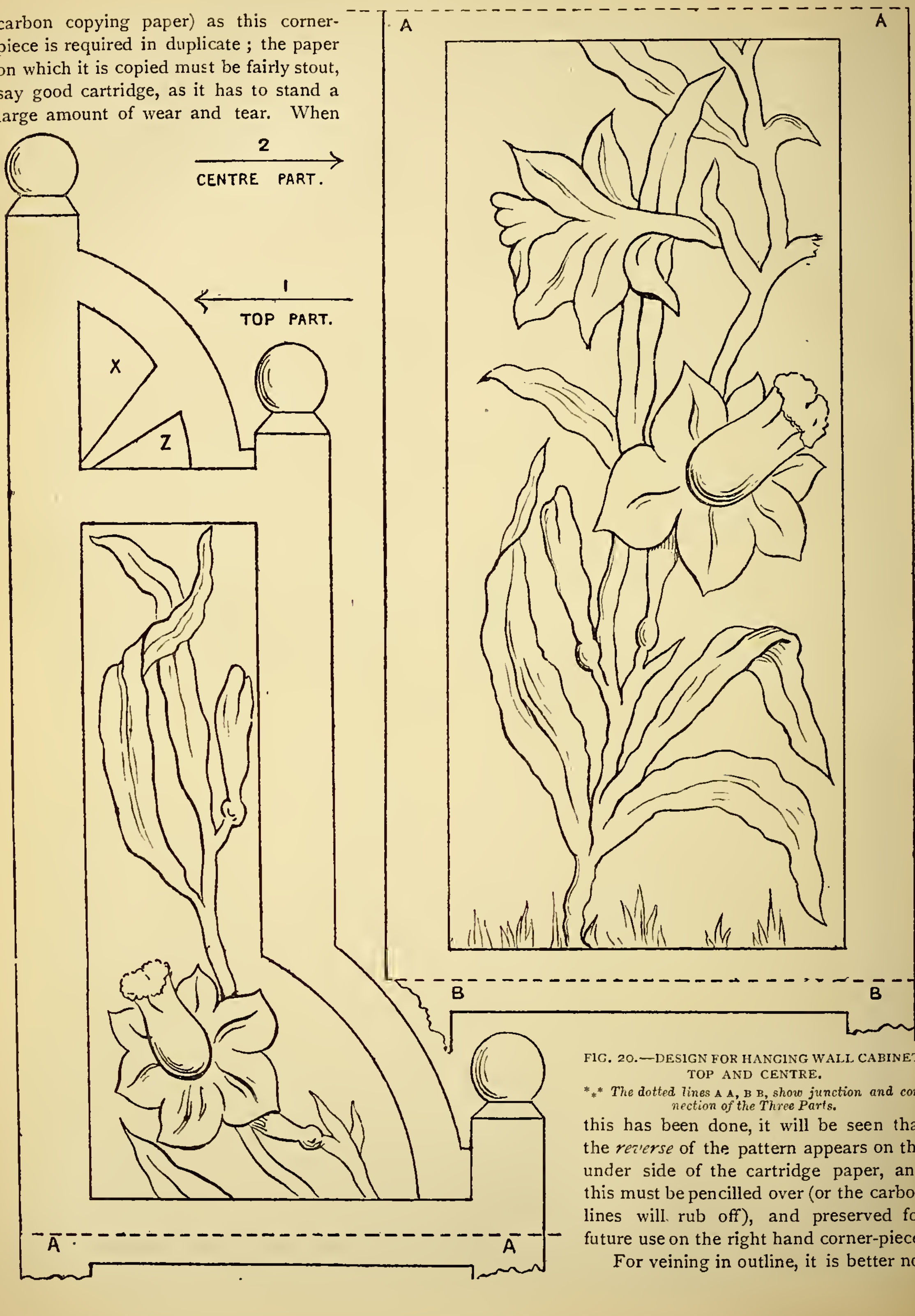


FIG. 20.—DESIGN FOR HANGING WALL CABINET, TOP AND CENTRE.

*** *The dotted lines* A A, B B, *show junction and connection of the Three Parts.*

this has been done, it will be seen that the *reverse* of the pattern appears on the under side of the cartridge paper, and this must be pencilled over (or the carbon lines will rub off), and preserved for future use on the right hand corner-piece.

For veining in outline, it is better not

to stick the paper upon the wood; as the tools are terribly blunted by contact with much paper, the best and simplest plan is to obtain a light impression by means of the aforesaid carbon paper, and then pencil over the lines. It will no doubt be very difficult to get the border lines veined straight and true, and when this is the case, the use of the marking gauge is permissible. The small spaces X, Z, at top and bottom are fretsawn, and the general outline sawn quite square and true; the knobs may be turned. In order to give this pattern full size, it has been divided and placed on opposite pages, but in the preliminary tracing it should be made in one piece, and so copied on the wood, which must be quite ⅝ inch thick.

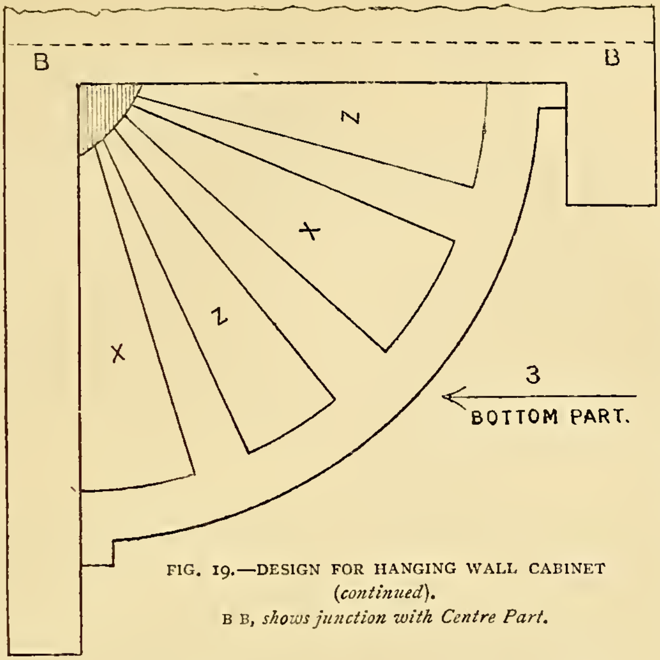


FIG. 19.—DESIGN FOR HANGING WALL CABINET (*continued*).
B B, *shows junction with Centre Part.*

For the trial design in ivy leaves, give a good hard rub with a nail brush just touched up with beeswax, this will bring out the pattern well, and for the present, the cabinet corners may be left unpolished, as I shall have some more to say on this head in a future paper.

FIG. 18.—SPECIMENS OF STAMPS FOR GROUNDWORK.

Although I have referred to the matter already in the foregoing remarks, yet, before I bring the present chapter to a conclusion, it may be desirable to say a few words more with respect to the "Design for Hanging Wall Cabinet," which has been given full size in three pieces, as it was thought better to do this than to present it on a smaller scale, which would have involved the necessity of enlarging it in order to obtain a full sized working drawing. The connection between the top part and centre in Fig. 19, and the bottom in Fig. 20, will be easily seen, and a complete tracing can be made without difficulty. I have known some people to whom it has been really a puzzle to put together the parts of a design exhibited in this way, and my experiences in this respect have induced me to be careful, though I cannot find it in my heart to believe that any reader of AMATEUR WORK will fail to see how to go to work to produce the complete drawing.

(*To be continued.*)

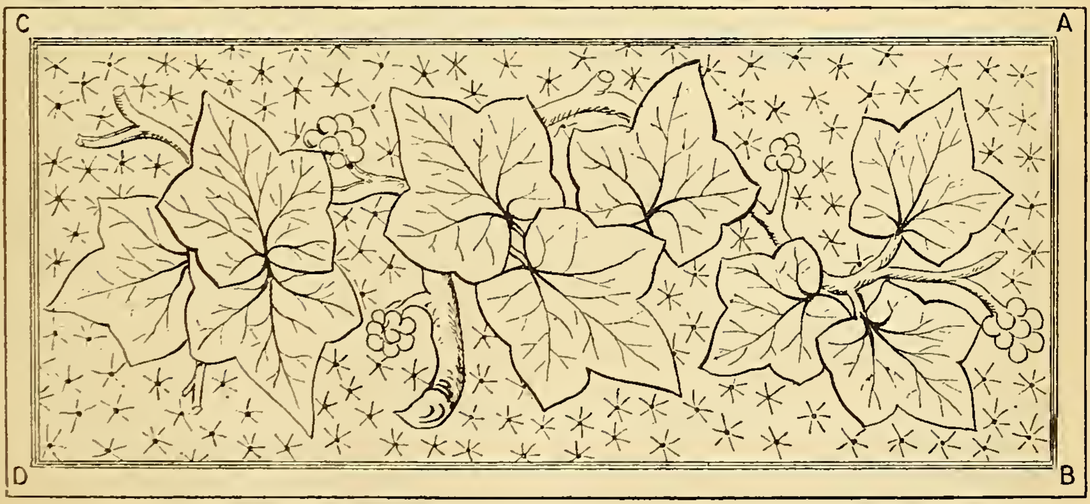


FIG. 17.—PANEL AS SPECIMEN OF VEINING IN OUTLINE—IVY LEAVES AND BERRIES.

HOW TO MAKE A TREADLE TOOL-GRINDING AND SETTING MACHINE.

By the Rev. ALGERNON THOROLD, M.A.

III.—THE GRINDING STONES—TANK UNDER WHEEL—RESERVOIR TO SUPPLY WATER TO STONE—TOOL-GRINDING REST—LEAD BAR AND BUFF WHEEL FOR SHARPENING CARVING TOOLS.

WE may now think about the upper axle which carries the grinding stones.

We begin by taking a similar bar to that used for the driving axle, both in length and substance, and since it is to be hung on bolts like the lower axle, it is only necessary to say that the ends must be steel hardened and conically drilled to fit bolts as before used.

The bar being ready, cut a square flat block of ash or elm 5 inches by 4 inches ; centre it, and bore a passage sufficiently large to allow the bar to be driven tightly through till one end projects a distance of one inch ; if needful wedge it up also.

If you have a lathe proceed to turn your block to the form of the flat channelled wheel and cone at C, C, in Fig. 24 ; B is a flat road for a strap, and should be 1½ inches wide between the flanges at E, E, to correspond with the road on the driving wheel. Of course, should the driving wheel be provided with speed grooves only, the flat wheel on the cone may be omitted entirely. D shows the speed grooves, and should be so turned as to correspond in position and depth with those on the driving wheel ; that is, the upper grooves should stand fairly over those below.

On an examination of Fig. 24, it will be seen that the axle under consideration carries three distinct wheels : F, an ordinary grit stone ; G, an emery wheel ; and H, a buff, or leather wheel. These wheels should be similar in diameter, otherwise the hand-rest, to be described presently, cannot be brought close up to them all alike.

Grit stones and emery wheels can be obtained through any tool-maker, and should there be a difficulty in turning the wooden centre for the buff wheel at home, any turner in wood would quickly provide what was requisite, or the complete buff wheel can be obtained with the others through the source above mentioned.

Emery wheels are made in various degrees of hardness, and are consequently adapted to different sorts of work. They are also coarse and fine, according as they are required for reducing rough surfaces, or grinding delicate tools.

Emery wheels can be used wet or dry, and far more work can be got out of wheels by applying what is to be ground, lightly to the surface than by pressing it, as this only heats the metal, and makes the wheels glaze and often go out of true.

In using emery wheels a slight lateral movement should be given to the work, for by this means the cut will be found to be fine, although the wheel may be coarse. On our machine there is only one emery wheel, but if there is much rough work to be done, it is well to have a coarse wheel and a fine one at different ends of a separate axle. The amount of labour saved by the use of emery wheels is very considerable. It has been proved that by hand labour a file can be driven over sixty feet of work in a minute ; but after half an ounce of metal has been removed the file is useless ; but in an emery wheel as soon as the surface points are worn down fresh points come up, of a substance which, next to the diamond, is the hardest in nature.

If it is intended to use the wheels for other purposes than grinding tools, it will be needful to select a wheel of proper density for the particular work ; for instance wrought iron is worked on a soft wheel, while edge tools require a fine hard wheel, but in both cases, if care be taken, no water is required ; but at the same time, unless the grinder be a proficient, it will be better to use them wet, and so avoid all danger of spoiling the temper of the tools.

If it is thought worth while, a separate axle can be fitted with a bevelled emery wheel for grinding saws, but this, of course, can be provided at any time when the efficiency of the machine for general work has been tested. Perhaps the chief difficulty in the use of emery wheels, is the speed required ; the greater the speed up to a certain point, the greater the amount of work done, and the higher the quality of the work. Good work, however, can be obtained with low speed, and, therefore, the amateur need not be deterred from fitting one up ; but those driven by steam-power attain 4000 to 4500 feet per minute surface speed, and is gained by about 1350 revolutions of the axle in the same time.

We may now consider the leather or buff wheel. This is only a solid block of wood turned to the required size, and covered with leather on its circumference. The block may either be turned on the axle in the same manner as the cone before described, or fixed on afterwards. In width it should be 1½ inch to 2 inches, thereby allowing plane irons and wide tools to be finished upon it. If the buff wheel is home made, it will only be necessary when the wooden wheel itself is ready, to procure the leather, and nothing perhaps, is better for the purpose than a soldier's belt.

To fasten it upon the wheel, cut one end of the strip of leather perfectly square, and peg it to the face of the circumference with wooden brads ; then

run a little thin glue over the entire face of the wheel, and pass the strap as quickly and tightly round as possible, till both ends meet; then peg down the loose end cut to the required length as before described, being careful to bring the edges well together, and the wheel is complete. When in use it should be rubbed over with a little emery powder and oil, but it must not be made wet or too soft.

The grit stone needs no description, it being of the ordinary kind used in shops and yards. In diameter it should be the same as the other wheels.

The wheels being finished, we must now fix them. To do this pass the buff wheel close up to the grooved cone, and wedge it as firmly on to the axle as possible with wooden wedges, being careful that they are of equal substance, otherwise, of course, the wheel will not run true.

The emery wheel will come in the middle, at an equal distance between the buff wheel and the grit stone, which must be fastened upon the axle within one inch of the further end, both these, as the buff wheel before, being firmly wedged in place with wooden wedges. It is of great importance that they should all run perfectly true; and no time spent on gaining this object need be thought wasted, after results depending upon the accuracy of our work on this part of the machine.

This portion of the work being finished to our satisfaction, the axle and its series of wheels may be hung. To do this we must provide ourselves with another set of plates, as shown in Figs. 19 and 20, and described before at length, and also with a pair of bolts, as shown in Fig. 18.

Passages for these bolts must then be bored in the heads of the uprights, 3 inches from the top, similar to those below, where the driving axle is hung, and the plates fastened into their places in all particulars as before described. This done, and the bolts being passed through, the axle may be hung in its working position with the grooved cone over the driving wheel; it only remains to connect the two with either a strap or gut, such as is used in an ordinary lathe. A leather band will cause greater friction, and, perhaps therefore, call out the strength of the grinder more than the gut, but with it there is no risk of a sudden breakdown, as sometimes occurs through the metal hook and eye parting company from the gut when the speed is high.

We must now provide water for the grit stone, and if thought requisite, for the emery wheel.

For this purpose we may first proceed to make a light boat-shaped tank, like Fig. 25.

This tank is intended to be placed beneath the wheel to catch the water as it drops from the receptacle provided above, and stands upon the beam connecting the uprights, and being movable, can be emptied and cleaned out as required.

In length it should be 1 inch longer than the diameter of the wheel, and 1 inch wider. It should stand 5 inches high, and may be shaped as in the dotted lines *b*, *b*, or left flat, at pleasure.

Any tinman will make such a thing for a moderate sum; but as no difficulty presents itself, doubtless, many of our readers will prefer to make it for themselves.

From a sheet of tin cut a band $1\frac{1}{2}$ inch wider than the stone, and in length rather more than half the circumference. Shape it into a semicircle, and flatten it in the middle $1\frac{1}{2}$ inch on each side of the centre, so that it will stand on any flat surface. It will then assume a shape like the dotted curved line in Fig. 26. On the anvil turn the edges over $\frac{1}{4}$ inch to form a flange standing at right angles to the flat. Cut two plane sides like Fig. 27, solder them to the band already prepared, fitting the outside face of the sides to the inside of the flange on the band; they will then form a long narrow semicircular box, having a flat bottom; round all the upper edges of both sides and ends, solder some stout brass wire, both for strength and finish. The tank is then complete, and may be passed under the grindstone.

This tank, as was said before, is only to catch the water as it drops off the stone.

Our next step is to provide the water, in such a way as to prevent the stone standing in it, which soon softens and destroys it.

We do this by means of a small reservoir hung over the stone and allowed to fall in such quantities as is required. Take a so-called round tin, 6 inches long and 3 inches in diameter, or thereabouts. Nothing will serve our purpose better than a small mustard tin; upon one side at top and bottom solder two tin or brass sockets, shaped to admit the squared end of a stout brass rod, similar to the sockets shown in Fig. 29, only smaller. On the side of the tin opposite to that on which the sockets are fixed, insert and solder on a small cock. Such as are used on model steam-engines, with a bent nose, or, if such cannot be obtained, a short length of $\frac{3}{16}$ inch brass pipe bent into a curve, may be affixed to the cock.

Now take a brass stair-rod and flatten it at both ends, that it may pass easily into the sockets, on the tin reservoir; shape the rod as in Fig. 28, that the reservoir may hang well over the wheel.

Now take two more sockets, Fig. 29, rather stouter than those already used on the reservoir, and screw them upon the back of the beam which connects the uprights of the stand immediately under the wheel, and into them drop the lower flattened end of the rod R, Fig. 28, as in Fig. 30.

By this contrivance it will be at once seen that the flow of water can be regulated to a nicety—a drop falling at intervals being all that is required, unless the speed is very great or the work heavy.

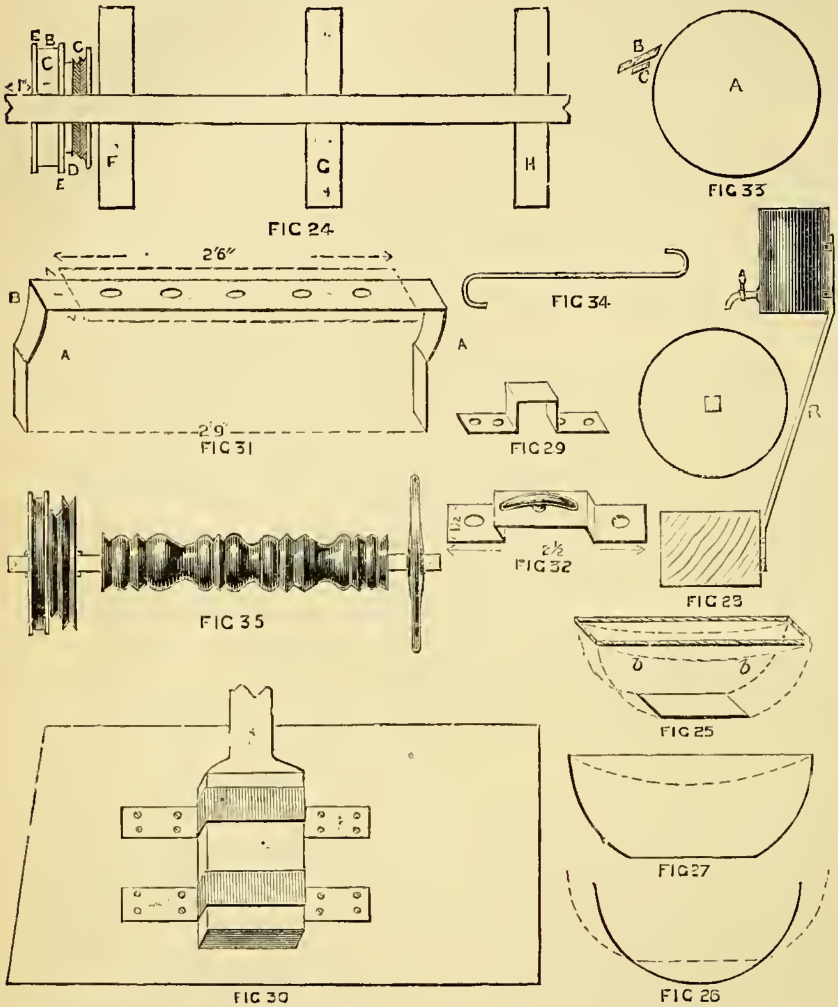


FIG. 24.—AXLE FOR CARRYING GRINDING STONES, ETC. FIG. 25.—TANK BELOW WHEEL. FIG. 26.—DIAGRAM SHOWING FORMATION OF BAND FOR BOTTOM OF TANK. FIG. 27.—SHAPE OF SIDES OF TANK. FIG. 28.—TIN RESERVOIR OVER STONE, AND MODE OF SUPPORTING IT. FIG. 29.—SOCKET ON BACK OF BEAM. FIG. 30.—BACK VIEW OF SUPPORT FOR RESERVOIR, SHOWING MODE OF FIXING IT TO BEAM. FIG. 31.—TOOL GRINDING REST AND ITS SUPPORT. FIG. 32.—SOCKET FOR RECEPTION OF SUPPORT OF REST. FIG. 33.—DIAGRAM SHOWING RELATIVE POSITIONS OF REST AND WHEEL. FIG. 34.—CONNECTING ROD BETWEEN CRANK AND TREADLE. FIG. 35.—LEAD CASE ON IRON BAR USED FOR SHARPENING CARVING TOOLS, WITH NARROW BUFF WHEEL.

If it is thought necessary, this gear for the water can be duplicated for the emery wheel, or if two sets of sockets are fixed, the reservoir and pan can be moved to either wheel as required at the time.

We now come to the hand-rest. Long experience enables the practical grinder to dispense with any support, either for his hand or tools, but without question there are times when a steady guide will be found most useful.

The rest, to be described, being movable, can be used or dispensed with as found most convenient.

An examination of Fig. 31 shows us that the rest is simply a strip of flat wood, about 2 feet 4 inches long, 3 inches wide and ¾ inch thick, shown in the dotted lines, set slanting at about 35° on a strong flat iron bar, B, 1 inch wide and ½ inch in substance. The ends of the bar it will be seen, are turned or twisted at another angle, and simply drop into two sockets, Fig. 32, which are fixed upon the uprights of the frame. These sockets are fitted with a thumbscrew for regulating the position of the rest.

It is always desirable to be well over our work in grinding; the rest should therefore be set about the centre of the wheels, as shown in Fig. 33 in section, in which A is the wheel; B, the rest; and C, the iron bar parallel with it.

The iron bar upon which the wooden rest is fastened from beneath through the screw-holes shown, must, of course, stand at least 1½ inches from the wheels; the length and twist, therefore, of the arms, A, A, from the front of the uprights must entirely depend upon the size of the grinding wheels used. The wooden rest fixed upon the iron bar projects on two sides, as shown, but in length need not exceed the full distance over the three wheels—more than 1½ inches on each side.

Fig. 34 shows the connecting rod between the crank and the treadle, and should be left until last, to insure the right length being obtained when both

treadle and axle are fairly in position. It should be made of ¾ inch flat iron bar, turned into a hook on opposite sides. The outside length will be found to be 12 inches.

All our parts now being in hand, half an hour will suffice to put them together and make trial of our machine; and if care has been taken in fitting the parts, all will work easily and smoothly from the first.

When all is in good working order, and the inevitable mistakes and inaccuracies adjusted, we may proceed to make our machine more useful still.

There are, for instance, many carving tools which cannot easily be sharpened on a flat surface, and though by patience and time rounded slips may do the work, a few minutes at our sharpening spindle will do what half an hour without it will not accomplish; and this we achieve by substituting a different series of sharpeners for the wheels already on the machine.

Take an iron bar similar to that used before for the large wheels, with cones drilled in the steel-hardened ends, to work on the pivots as before. Upon it also turn a similar grooved wooden cone for the gut and band. We must now take the bar to a foundry, and get a lead case 3 inches in diameter cast on to within 3 inches of both the cone and the opposite end of the bar.

The next step is to have this lead case turned into a series of rounds and hollows and bevels (see Fig. 35), cutting down fairly deep, that quick tools may ride well in the hollows and on the rounds. The bevels may be used for "parting tools." When in use, the whole series should be covered with a little emery powder and oil; and by this means a very fine edge is obtained.

At the end of the bar furthest from the cone we may also fit a thin 12 inch diameter buff wheel, and which should not exceed ½ inch in thickness. The edge of this wheel should be rounded. (See Fig. 35.) It must be wedged on as before described, and should be turned considerably thicker in the middle than at the edges, to afford a firm bite on the spindle.

In a future paper, perhaps, a few hints may be given, by which this machine may be utilised both as a rough lathe and for a circular saw; but for the present it will be better to confine ourselves to putting into practice what has already been written.

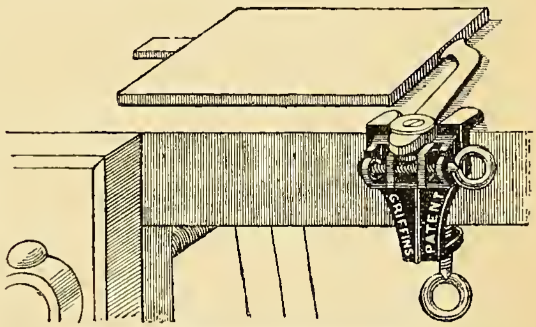
In case any point should seem doubtful or obscure, I shall be pleased to answer questions through "Amateurs in Council." I trust, however, that I have made my description of the machine and its component parts sufficiently clear and intelligible to prevent causing much trouble to readers of AMATEUR WORK on this score.

GRIFFIN'S PATENT BENCH KNIFE OR BACK STOP.

By J. F. T. BAILEY.

IN addition to the many "new things" which from time to time have been brought under the notice of readers of AMATEUR WORK, I desire to add the following particulars concerning yet another "novelty," recently introduced by that indefatigable tool-producing house, Messrs. Booth Bros., 63, *Upper Stephen Street*, *Dublin*, to whom mechanics generally, and amateurs particularly, owe so much.

This "new thing" now brought to your readers notice for the first time, as far as I am aware, is Griffin's Patent Bench Knife or Back Stop. Ingenious, strong, yet simple contrivance that it is—specially designed to supply a want long felt alike by



GRIFFIN'S PATENT BENCH KNIFE OR BACK STOP.

amateurs and the trade—will be found by carvers, cabinet-makers, carpenters, and others, a most valuable aid, as a glance at the illustration will at once show.

Hitherto many have been the plans which "wood-workers" generally have been driven to devise, to firmly hold pieces of wood of varying lengths to their bench while being planed or carved, etc.

Screws, nails, etc., and many other—at best unsatisfactory—shifts have prevailed, resulting generally in defective workmanship, loss of time and temper, and a disfigured bench. Griffin's Back Stop puts an end to all such annoyances. All that is necessary to be done is, place the piece of wood, one end against the bench stop, and at the other clamp the back stop by means of the screw below (see illustration), then, with side-screw, move forward the knife until it firmly grips the wood. As the knife lays quite flat on the bench, it is capable of holding all thicknesses of wood, from ¼ inch up, without interfering with the plane. I find, when cleaning pieces

of wood held by this back stop, that the force of the plane does not cause the wood to shift, even when working on the edges ; and I get a job done much better and speedier, and with less strain on muscle or temper than when (as previously) I had to "pock-mark" my bench by driving screws or nails behind the wood ; and everybody will admit what an assistance to clean work is a clean bench.

For flush-faced benches the back stop is provided with an eccentric, acted upon by a small lever in lieu of the underneath projection and screw, and a series of $\frac{3}{4}$ inch holes must be bored along the front edge of bench, at a distance of 2 inches apart from centre to centre of hole, and $1\frac{9}{16}$ from top of hole to top of bench. The eccentric is placed in hole, and the small lever on right-hand side pressed down, effectually grips the "stop" to the bench; the knife, in both kinds, being moved forward by the side-screw. Consequently, in ordering, it will be well to state the kind of bench for which required. To those who have not a bench, and work on a table, the first-mentioned "stop" is best adapted ; but it would be advisable to strengthen the edge of the table underneath with a slip of wood from one to two inches thick.

These handy appliances—made of strong metal, well finished, likely to last a life-time without derangement—are only 3s. 6d. each ; with postage on one or two, 6d. extra—a sum, everybody who realizes the usefulness of the tool will consider well invested.

I have had an opportunity of examining both kinds of bench knife or back stop described above, and find them to be most desirable adjuncts to the work-bench. Amateurs who may be induced to buy them, will, I think, find them very serviceable appliances.—Ed.

HOW TO CONSTRUCT A SIX-INCH WOODEN LATHE.

By OLLA PODRIDA.

II.—FRAMING, HEADSTOCK, ETC.

FRAMING—UPRIGHTS, FEET, Etc.—These may be made of the same material as that employed for the sides of bed. Fig. 11 gives two views of the left-hand upright, which, as the sketch shows, also forms part of the headstock. Fig. 12 gives two views of the right-hand upright. Fig. 14 gives plan and elevation of the feet; and Fig. 13 shows the stay-bar which carries the treadle and ties the feet together at the back.

To make the left-hand upright, Fig. 11, we shall require a piece of timber 3 feet $6\frac{1}{2}$ inches long by $6\frac{3}{4}$ inches wide and $3\frac{1}{8}$ inches thick in the rough. First plane it up truly with attention to the instructions already given for the sides of bed. When planed the width should be $6\frac{1}{2}$ inches and the thickness 3 inches, in accordance with the figured dimensions which in each figure show the finished sizes. Let the best end of the stuff form the headstock part, and mark the tenons on the other. These tenons are two in number, as shown, each $1\frac{1}{8}$ inches thick and $2\frac{1}{4}$ inches wide, thus leaving between them a space of 2 inches. They may be left a little longer than the depth of the feet, so as to allow for cleaning off after being finally fixed. Mark the steps, or recesses, for receiving the bed at A, A. These steps are 5 inches long by 2 inches deep, or in accordance with the dimensions of the bed, which must be fitted very snugly into them.

In marking these steps square the line for upper shoulder right across the *outside* of upright, so that it (the line) may be available in setting off the height of the centre of mandrel bearing. A vertical centre line must also be gauged on the outside of upright. On this line the centre of mandrel bearing will be found at 6 inches from the square line of upper shoulder of step. After striking out the outline of this part, the hole which receives the brass bush forming the mandrel bearing may be drilled. A sharp $1\frac{1}{8}$ inch centre bit will be required, and great care must be exercised to ensure the hole being square with the face of upright. The outlines may be shaped and finished after the hole has been drilled.

Should the alternative form given in Figs. 5 and 6 or 7 and 8 be adopted, the outline only should be finished, the hole for tail-pin being marked and bored after the framing has been put together. This will receive attention under the heading of alternative form of headstock.

Returning to the uprights, the right-hand one may now be planed up and clamped to the left-hand one, so that the steps and tenons may be cut in both at one operation, thus saving time and ensuring greater accuracy.

At this stage the plates or nuts for centres of crankshaft may be let into the uprights and fixed permanently. To facilitate the fitting of these plates the screws should also be at hand. These plates and screws are alike for each end of the shaft. Fig. 17 shows the form of plates, and Fig. 18 the screws. The plain part of screws should fit tightly into the uprights, to ensure rigidity and to partly relieve the plates. Fig. 19 shows an alternative form of centre for the right-hand end. In this form the centre is riveted into the plate. Screws at both ends are preferable, as they afford better means of adjusting the

fly-wheel fair with the cone pulley on mandrel; they can also be partly turned round as wear takes place, an advantage especially at the fly-wheel end, where the greatest weight lies.

To fit the plates properly, first bore the holes in uprights at the positions shown by the figured dimensions at P, P, Figs. 11 and 12, then drive in the screws until the threaded parts come through. Now screw on the plates close up to the inside faces of uprights, and scribe lines on the wood to the edges of the plates and mark the relation of each plate to its upright. Remove the plates and screws and let in the former into the uprights, flush or level with the surface of the wood. The lines must be very carefully worked to, otherwise the relation of the holes in plates with those in uprights will be altered. See also that the plates bed fairly. Before fixing the plates the centre screws should be tried in, to see if the holes are fair; if such is the case, then the plates may be finally secured by four wood-screws in each, at the corners, as in Fig. 17.

The centre screws may be made of cast steel or wrought iron tipped with steel and hardened at the points, but iron well case-hardened will be found to wear very well if kept properly lubricated. They are shown in Fig. 18 as being $\frac{5}{8}$ of an inch in diameter, but $\frac{1}{2}$ inch, if that size is more convenient, will suffice. Lock-nuts, to prevent them from shifting, should be fitted. The proper place for the lock-nut at the fly-wheel end is on the outside of the upright, but this would necessitate another plate or washer. If the screws are made to fit tightly, lock-nuts may be dispensed with.

The feet—seen in plan and elevation, Fig. 14—are alike. For each foot a piece of timber 2 feet $8\frac{1}{2}$ inches long by $4\frac{5}{8}$ inches wide and $3\frac{1}{8}$ inches thick will be required. Plane up to the figured dimensions, and mark the mortise holes from the tenons on uprights, also mark the relation of each to its upright. The mortises must be cut truly square with the base of each foot, and the tenons carefully fitted. The tenons may bear tightly against the *end* grain of the wood but not sideways, as in the latter case the feet would be liable to split. The mortise-holes for stay-bar should also now be cut, and the bar fitted. The length of the bar, over the shoulders, will be governed by the length of the bed. If the dimensions given are adhered to throughout, the bar will measure 2 ft. $8\frac{1}{2}$ in. by $4\frac{1}{2}$ in. by 3 in., as figured on the sketch. The tenons are thrown to one side—the upper, when in place—and are 3 inches wide by $1\frac{1}{4}$ inches thick, the bar itself being 3 inches square.

Remarks on Framing.—Each upright may first be fitted into its foot, and their relation marked to avoid confusion. Next the stay bar may be fitted, and also marked. The hoop-iron strap S, at the front (Fig. 3), can be fitted at any time after the bed has been bolted up. The uprights may then be fixed into the feet with glue and wedges in the usual manner, as also the stay-bar at the back. This stay-bar may be secured by pins alone if portability of the whole is a future consideration. The bed may now be clamped in place, so that the holes for the securing bolts may be bored. Before boring the bolt holes see that the bed is square with the uprights, especially the left-hand one, and examine with a straightedge the relation of the upper edges or faces of the sides, which should lie in the same plane. A small difference may be neglected, but if the shoulders of the steps on uprights have been properly marked and cut the sides should be true. The bolts are $\frac{5}{8}$ of an inch in diameter, and two to each end placed as shown in Fig. 1. They may be obtained at most ironmongers' shops.

Details of Woodwork, etc., for Headstock.—Fig. 15 gives front and side elevations of front part of headstock. The extended part, shown by ticked lines, gives an alternative method of fixing this part to the bed. In Fig. 1, at O, a bolt is shown, which passes through the sides of the bed and secures the front part of head, but if this part is made to fit tightly between the sides of the bed, the bolt may be dispensed with, and the ticked form used alone. Both should be used, if possible, to insure in every direction due rigidity of the principal part of the headstock.

To make the front part we shall require a piece of timber 17 inches long by $6\frac{3}{4}$ inches wide and $3\frac{1}{8}$ inches thick in the rough. Oak, teak, or such hard and well seasoned wood should, if obtainable, be employed. Plane up to figured dimensions in sketch, for outside width and thickness. Square a line across the face to depth of shoulder at *a*, Fig. 15, and carefully mark a centre line lengthwise of the stuff and at right angles to the shoulder. Mark these lines upon the side chosen for the front, and on the centre line set off the centre of mandrel bearing 6 inches from the shoulder, or to the distance or height of the centre in upright or back part of head, with which the front must correspond exactly. Now strike out the outlines given in the front and edge views. The hole for bush forming mandrel bearing may now be bored. A sharp $1\frac{1}{2}$ inch centre-bit will be required for this, which must be done very carefully and as square with the face as possible. This part may now be shaped to the outlines. Cut and square the shoulders very carefully, working all the time to the front face of the head, and keeping to the square mark for height, which, as already stated, must agree exactly with the back part, otherwise the mandrel will, when tried in, be thrown out of line.

The "liner," or distance piece, which fits between the front part of head and upright, may now be pre-

FIG. 11.—LEFT HAND UPRIGHT.
FIG. 12.—RIGHT HAND UPRIGHT.
FIG. 13.—STAY, OR TIE BAR.
FIG. 14.—PLAN AND ELEVATION OF FEET.

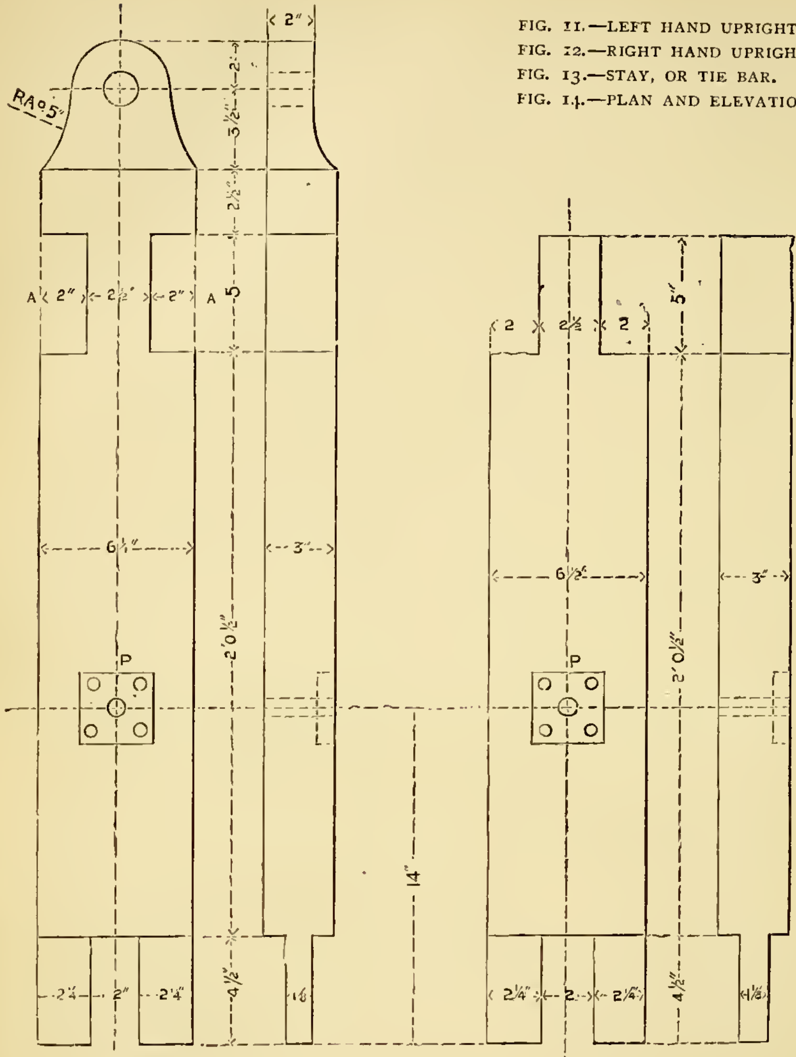


FIG. 11.   FIG. 12.

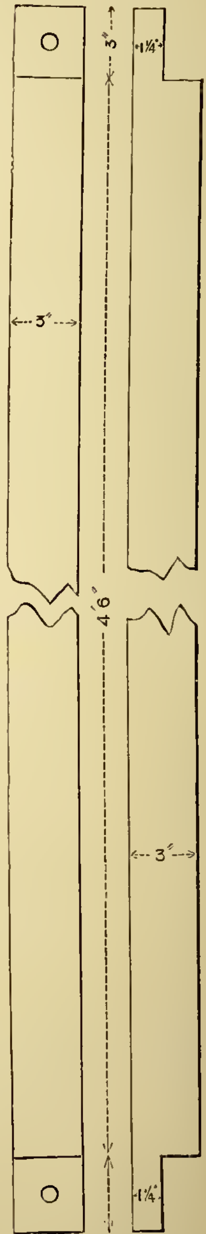


FIG. 13.

*** All Figures drawn one-eighth full size, or 1½ inches to 1 foot.

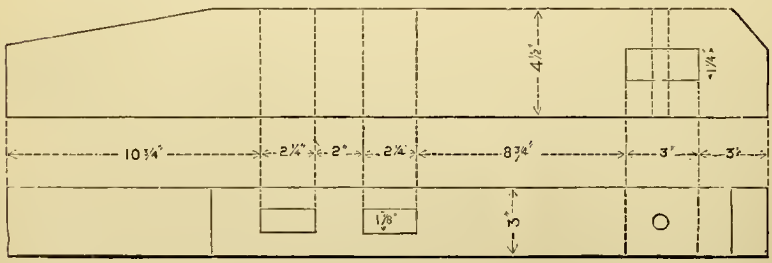


FIG. 14.

FIG. 15.—FRONT PART OF HEADSTOCK.
FIG. 16.—LINER BETWEEN FRONT AND BACK.
FIG. 17.—PLATE FOR CRANKSHAFT CENTRES.
FIG. 18.—CENTRE FOR CRANKSHAFT CENTRES.
FIG. 19.—ALTERNATIVE FORM OF CENTRE.
FIG. 20.—TAIL PIN AND BRACKET.
FIG. 21.—BUSH AND BEARING FOR MANDREL—FRONT.
FIG. 22.—BUSH AND BEARING FOR MANDREL—BACK.

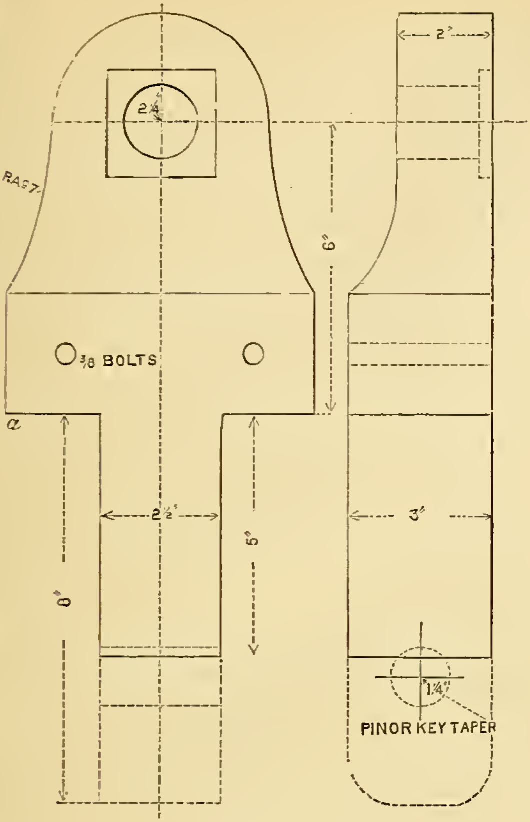


FIG. 15.

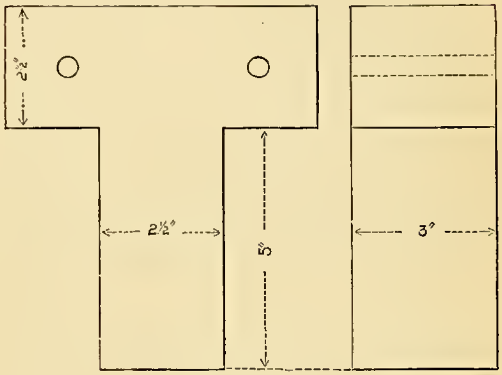


FIG. 16.

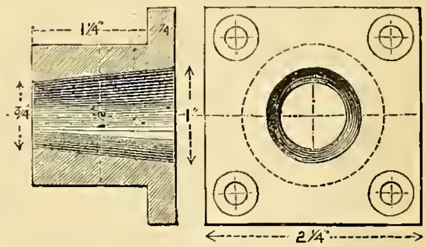


FIG. 21.

*** All Figures, except Nos. 21 and 22, drawn to a scale of one-fourth, or 3 inches to a foot. Figs. 21 and 22 half size.

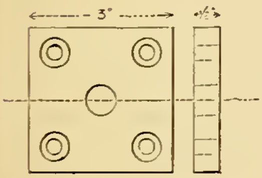


FIG 17

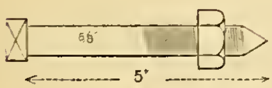


FIG 18

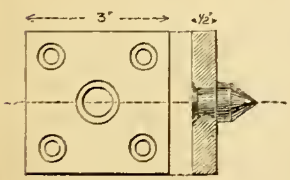


FIG 19

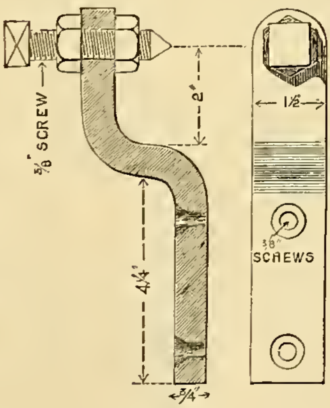


FIG. 20.

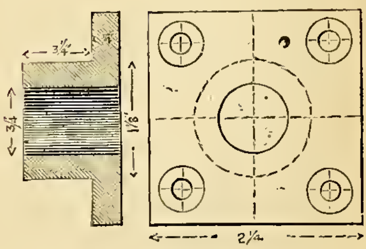


FIG. 22.

pared. It is shown with all dimensions in Fig. 15. The preparation of this being a simple matter, detail is unnecessary, but care, nevertheless, must be taken to ensure its being quite parallel in thickness, otherwise it will affect the front part of head when bolted to it.

The "bushes," or bearings, for mandrel may now be fitted in place together with the mandrel, which is indispensable during this operation. The bushes are shown in detail in Figs. 21 and 22, front and back respectively.

For the present it will be assumed that all metal parts pertaining to this lathe have been purchased or obtained. Sketches of each part in detail are given, but detailed descriptions of their preparation are at present omitted, seeing that I am addressing myself more particularly to those amateurs who have not access to lathes, or machines, or who are unacquainted with metal work. Before the conclusion of these papers, however, attention will be paid to the metal work, and full information given as to where, how, and at what cost such parts may be obtained. In the meantime, the detailed sketches may be of assistance to any capable amateur or practical man feeling inclined to take in hand the construction of the lathe under notice.

Returning to the bushes : these should be obtained bored, turned, and the flanges faced on both sides, or bored, and one side only—the outside—of the flange faced. These flanges must be let in flush, or level, into the headstock, great care being taken to ensure that they are fair and true with each other axially. If the holes in the wood have been bored truly and of equal height, there will be little trouble in setting the bushes. Before letting in the flanges it will be advisable to put the bushes in place and try the mandrel in to see how things stand. This will give a rough idea of the relation of the bearings. Of course, the liner and front part of headstock must be temporarily fixed in place before doing this.

If the back end of mandrel is low, then the liner must be thinned, or tapered towards the lower end, and *vice versa* if the mandrel is high at the back or tail pin end. The bushes may also be let in so as to favour the mandrel a little. If after they have been let in, and the mandrel is yet of truth, then the front part of head and the liner must be manipulated as required, or shown by the state of things. If too high bodily, a little must be taken off the front shoulders, but not much at a time for fear of bringing them too low, and thereby necessitating the objectionable remedy of packing or lining up again. If the mandrel is out of truth sideways, then the front must be twisted to meet this by easing the tongue between the sides of the bed, and tapering the liner to one side as required. The nearer perfection is approached, in all cases, the greater must be the care exercised to avoid making a false step. When the bearings have been roughly adjusted in this manner, the bolts must be fitted through the members of the headstock, the taper pin—ticked in Fig. 15—driven in and the bolts screwed up tightly. This will, very likely, alter the relation of the bearings either for better or worse. In the latter case, more adjustment and patience will be required ; a stock of the latter article is indispensable to the attainment of a respectable finish.

When the adjustment is nearly complete, a little red lead mixed with olive oil, and rubbed on the bearings of the mandrel, will show clearly the relation of the bushes and state of the bearings. Very little must be used, a mere soiling of the surface being sufficient. In the absence of red lead, chalk alone may be used as a substitute. An extra touch to one or other of the bolts, or a tap on the taper pin, as may be required, will be sufficient in the last stages. Do not grind in the bearings with emery powder or any other medium. When properly fitted, the mandrel should turn freely, but without shake.

The bracket, carrying the tail-pin or back centre, may now be fitted. This bracket, with tail-pin in place, is shown in vertical section and end elevation in Fig. 20. To determine the position of the bracket, the tail-pin must be put in place and brought to agree with the countersunk centre in end of mandrel, the bracket meanwhile being held tightly against the upright or back part of headstock. When it has been properly adjusted, the holes for woodscrews are to be marked and carefully bored. The bracket may then be finally adjusted and fixed, so that the tail-pin and mandrel agree with each other axially.

The foregoing instructions apply to the form of headstock figured in connection with the general arrangement given in Figs. 1, 2, and 3, also in detail in Fig. 4. In the next paper I will describe the construction of the alternative form given in Figs. 5 and 6.

(*To be continued.*)

THE "WHITE LILY" MANTELPIECE.

AN EXPERIENCE IN FRETWORK.

By W. A. FOX.

(*For Designs, see Folding Sheet issued with this Part.*)

THE Briton, we are told, never turns his back on the fire of an enemy, but invariably does so on that of a friend. I suppose, like all rules, this has its exceptions, for I think I can recollect a true Briton criticising the chimneypiece, and passing

opinion that it spoilt the appearance of the room. Perhaps there was no fire in the grate, and that was how he came to face about. I cannot say, but whatever he did, I can call to mind several occasions on which, although I consider myself a true Briton, I have faced my own fire, as also that of a friend, else these lines would never have been written. It was while making an exception to the rule that my white marble chimneypiece caused me dissatisfaction, and led me to replace it by something more in harmony with the furniture and general decoration of the room.

In the drawing-room the azalea mantelboard and a pair of curtains effected my purpose. Next came the dining-room: drapery, one does not want too much of in this apartment, and yet that wretched expanse of white must be hidden away somehow, but not at the expense of buying a more suitable one. Then came self-help to my assistance, and I resolved to make a case to cover the objectionable structure, having its face composed of fretwork panels.

On more minute examination I found that the fixings of my mantelpiece were so decayed, that the simplest plan was to take the whole thing down and replace it with the one in fretwork, relegating to the distant future the task of commissioning a mason to replace the marble in the event of my leaving this house. Meanwhile, I have put up my own manufacture with screws, and in such a manner that it can be removed without doing damage to the walls, or, at anyrate, only such damage as can be made good in the replacing of the original structure.

I will describe the work in a general way, and as I made it, leaving the reader to make the necessary slight alterations to suit his particular case. A piece of furniture such as this is subject to great variation in dimensions. These alterations can easily be made, as all the designs have plenty of margin, and a little added to or taken off them will not make any difference, and there will be no necessity for interfering with the dimensions of the pattern itself.

The fretwork panels I cut in walnut, $\frac{3}{16}$ in. thick, and backed them with oak, which offers an artistic contrast. The rest of the mantelpiece consists of a framework of good deal or pine roughly put together with nails, and, when complete, stained and polished; the face edge of the deal being covered with moulding which I bought, and of which I shall speak in its place. The best way to set to work, after having decided on dimensions and materials, is to make the deal framework. All deal 1 in. thick and 6 in. wide.

Take the 1 inch deal boards, 6 inches wide: one 5 feet 2 inches and the other 2 inches longer. At a distance of 8 inches from each end of the shorter piece mark a line across, and another line an inch beyond each of these. Cut away the wood between these lines for 3 inches, or half the width of the board. Now take a pair of boards 4 feet 3 inches long, and at 8 inches from one end of each cut away two pieces similar to above. These three boards so treated will now fit together after the manner of the corners of an Oxford frame. Now take the 5 feet 4 inch board mentioned above, and nail it along the top, across the pair you have just put in place, and next nail in two 4 feet 3 inch boards parallel to and outside the pair of the same size. This all but completes the framework, which now requires a strip of 10 inches by 1 inch square to be fitted across, 12 inches from the bottom of each 4 feet 3 inches pair. Now get four pieces of board 13 inches by 6 inches, and fasten one on each outer side of these, so as to come up to the cross-pieces just let in, using screws, driven from the inside into these small boards. Now cut rabbets $\frac{5}{8}$ inch deep and $\frac{1}{4}$ inch wide along each of the spaces which are to contain panels. The rabbet in the bottom 12 inch space will have to be cut $\frac{1}{4}$ inch into the outer boards, so that they will be $1\frac{1}{4}$ inch wide. A glance at Fig. 9 will help you to understand this description.

Having completed the frame, put it in position and secure it to the wall. I did this very satisfactorily with a dozen L clamps, one arm of which is screwed to the inside of the frame, and the other to the wall. One of these is shown in position in Fig. 8. Now fit each of the spaces in frame with a pair of $\frac{3}{16}$ inch panels, one of walnut and the other of oak, or some light wood.

On looking at the walnut panels with which our work now lies, you will find that you have two of each shape, except that which fills the top central compartment. Make this also into a pair by cutting it in halves. Now place each pair together with what is to be the face of each in apposition; paste the corresponding design on the back of one of the boards, and fasten them by means of screws driven into the white portions of the design, *i.e*, waste wood. By cutting your fretwork in pairs face to face, you will get clean outline when finished, and the similar parts of the pattern will oppose one another when put up in place. This will also save you the trouble of removing the paper pattern and the labour of sand-papering, etc. Then, it will also give you an opportunity of French polishing your work before cutting, if you are so inclined. In this case it would be advisable to place a sheet of slightly oiled tissue paper between the polished surfaces, to prevent their becoming damaged by sticking to one another.

The top central panel, which I advised you to cut in two, is similarly treated. The line thus made being hidden when the panel is in place by means of the

shield, which you will have to cut in oak and lay in place over the palm leaves. This shield bears no design, for obvious reasons.

Having so far completed the chimneypiece, let us now turn our attention to the mantelboard. For this we require a 1 inch deal board 5 ft. 11 in. by 12 in. Fit into the corners, and at two equidistant points in part of this board six little pillars $3\frac{1}{2}$ in. high by 1 in. square, and rabbeted on the two opposite sides, to receive the $\frac{3}{16}$ in. fretwork railing.

The rail, Fig. 6, is cut in three lengths of oak, for front, of about 13 inches screwed together, and for sides in two lengths about $10\frac{1}{2}$ inches, giving you five pieces for the trouble of cutting two. Fit these in their places, and then put over them a top rail, which is rounded on a box, and rabbeted underneath to receive the fretwork. The ends will gain in strength by having a small tongue made to fit into the rabbets in the pillars, the tops of which are finished off by the addition of either brass or wooden knobs, of which you may have a variety to choose from, by asking at any furnishing shop for "shutter knobs."

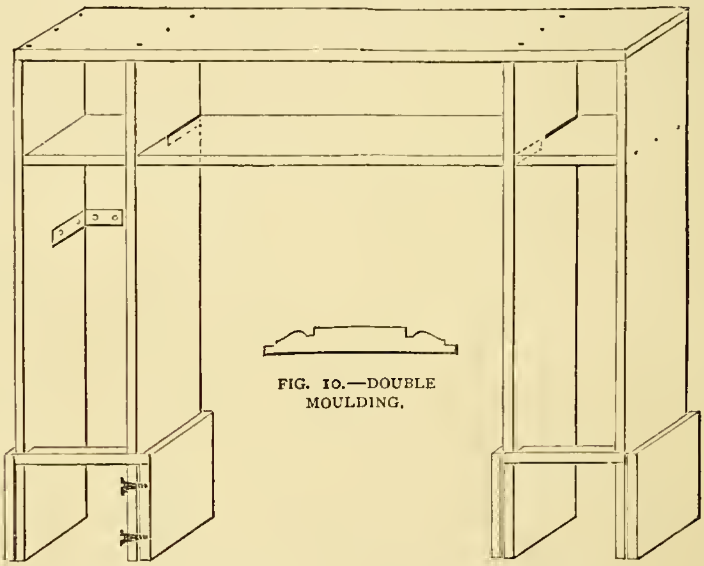


FIG. 10.—DOUBLE MOULDING.

FIG. 9.—DIAGRAM SHOWING FRAMEWORK OF MANTELPIECE.

The mantleboard is secured in its place by screws driven down into its under surface, through the top of skeleton; and gains extra support from four brackets, Fig. 5, cut in 1 inch pine or deal.

I purposely omitted any mention of staining and varnishing, so as to speak of it at one time. The reader will see that he has to deal with rosewood backing, oak fretwork, and a frame of white ungainly looking deal. The rosewood and oak I would recommend him to leave alone. The deal must be stained a colour to harmonize with the above, and match the moulding with which the panels are to be secured, and of which mention will be made presently, though it will be necessary to procure your moulding before deciding on the colour of stain. In any case, the reader cannot do better than use the Torbay Company's old oak or walnut varnish stain. I used old oak, and two coats of this gave me the colour I desired, plus a degree of polish very nearly resembling that on old oak furniture. It is easily laid on, gives a good effect, and, moreover, is sent out in such a convenient form, that it is a pleasure to use, and then to put away for future use.

Now, with regard to the moulding, Fig. 10, I bought mine through a local joiner; but I daresay Mr. Gus. Rochefort will be able to assist the reader, who will require about 26 feet moulding, $1\frac{1}{4}$ inch wide. This to be secured by means of glue and needle points.

To do so neatly, the ends will have to be mitred; but I have no doubt most amateurs are in possession of a mitre-box, if not, they can, as I did, make one in a few minutes, under the lucid directions of Mr. Milbrook in Vol. II., page 130. The edge of the mantelboard may be left as it is, or this may also be covered with moulding.

I think the reader will at this point behold a very handsome reward for his patience and labour; and if, as in my case, the reward displaces a hideous edifice in white marble of no design whatever, I hope his satisfaction will be as great as mine.

The railing offers a novelty, which adds greatly to effect; and in a dining-room where the mantel bears a clock and two bronzes, it will not be in the way of such knick-knacks as occupy the position in the drawing-room. If desired, the top rail may be made to harmonise with the knobs, if of brass, by making this part also of brass.

As I said at the commencement, my mantelpiece replaced the marble one. If the reader desires to cover his, he need only make it of a size large enough to slide over the existing structure, and cut away such portions of the framework as require it.

The designs given in the Folding Sheet are half the size of the working drawings. To make these quickly and easily the amateur should provide himself with a pantagraph, which he can buy for a few shillings, and which is mentioned in Vol. II., page 303. This instrument is extremely useful for accurately enlarging or reducing drawings of any kind.

PHOTOGRAPHIC APPARATUS:

ITS PREPARATION AND CONSTRUCTION.

By J. POCOCK.

VII.—THE DARK SLIDE: ITS USE, AND HOW TO MAKE IT.

IN order to obtain several photographs in one day without the necessity of a visit to the dark room between each operation, it is obvious that we must either provide ourselves with several dark slides, each one carrying its two plates, which are changed at the end of the day's work; or else we must be provided with some means of changing our plates in the field, and, from the necessities of the case, the apparatus used must be as portable as possible.

For changing plates in the field, we may use either one of the dark tents already described, or a simple bag of light-tight material, wnich being drawn over the head and arms of the operator, is fastened firmly round his waist; or we may use an automatic changing box, to which the dark slide is attached when it is desired to change a plate, and the exposed plate slid into the box, any desired plate being afterwards transferred from the box to the dark slide in the same manner. The making of this piece of apparatus should, however, be attempted only by a skilled and practised hand, being beyond the powers of the majority of amateurs.

A third plan is to make a thick dark slide, which will contain six or more plates, of which each successively may be brought automatically to the front for exposure. Such a dark slide, would, in fact, constitute changing box and dark slide both in one, and as this form is the easiest for an amateur to construct, it is the one I shall describe in the present paper.

Fig. 61 shows this dark slide when closed. It may be made of $\frac{1}{4}$ inch wood, and the sides are made as for an ordinary box, $1\frac{1}{2}$ inch to $2\frac{1}{2}$ inches deep, according to the number of plates it is intended to carry, $\frac{1}{8}$ inch higher inside than the length of the plates, say $4\frac{3}{5}$ inches for quarter-plate size, and the length rather over double the width of the plates, say $6\frac{3}{4}$ inches for quarter-plates. The sides are cut $\frac{1}{8}$ inch narrower than the top and bottom, and the side, A, is dovetailed to the top and bottom, so as to be flush with them at the back, thus leaving room for the shutter, G, in front. In putting in the other side, B, space is left at the back for a similar shutter, shown in Fig. 62, at C, flush with the top and bottom in front.

In the top and bottom pieces themselves, four saw-cuts are made, about one-sixteenth inch deep, as follows: One in the top and one in the bottom, distant $\frac{1}{16}$ inch from the front edge, and extending half-way along from the left-hand side, and two similar cuts at the same distance from the back edge, extending half-way along from the right-hand side. Small slips of brass plate are ultimately to be inserted in the top and bottom of the two shutters, these plates sliding in the saw-cuts, and thus keeping the shutters in position. The front piece, E, has two springs screwed upon it, one, $\frac{1}{2}$ inch from the one end, and the second at the same distance from the other end, so as just to clear the top and bottom of the box, as shown in Fig. 63, which represents the inner view of this piece, while in Fig. 62 it is shown screwed on in position. Two similar springs are also to be screwed to the back, as shown at Fig. 64. The back must be made loose, and held in place by two small buttons, or it may be hinged or fastened on in any other way, so long as it can be readily detached for the purpose of refilling the box with slides, and is perfectly light-tight when closed.

Two grooves must be made in the top and bottom of our slide, in order to allow the box to slide into its place on the camera in a similar way to an ordinary dark slide. These are not shown in the figures, because their form and position will vary according to the make of the camera with which the dark slide is to be used.

A slip of wood must be fastened on the inside or each shutter after it is in position to prevent its being drawn quite out, but before this is done small recesses must be cut in the sides of the box to receive these slips, so that the shutters may be drawn out till their ends are flush with the inside of the box. If there is any danger of light entering the box, its ends may be grooved to $\frac{1}{4}$ inch in depth on the edges against which the sliding shutters work; then a small strip of wood must be cut to exactly fit this groove in width, but only $\frac{1}{8}$ inch thick, and a small spring attached to it, as shown in Fig. 65, A and B, and this strip being slipped into its place in the groove before the shutter is put in, the spring will keep it pressed close against the shutter, and form an additional protection against the entrance of light. Two strips of wood $\frac{1}{2}$ inch wide and $\frac{1}{4}$ inch thick are to be screwed, one at the top and the other at the bottom of the front of the slide, on the left-hand side, as shown in Fig. 62, by K and L, and this portion will be finished.

As many carriers of tin or zinc, as the number of plates which the slide is intended to carry must now be made. These are made from pieces of tin or zinc, $3\frac{7}{8}$ by $5\frac{1}{2}$ in. square, the top and bottom and one side being turned over for $\frac{3}{8}$ inch, as shown at Fig. 66, so that they will form holders into which the plates will slide.

The apparatus is now finished, and we will consider how it works. Supposing the slide to have been made to contain nine plates in their holders, and these nine plates to have been placed in it from the back, five on the exposure side and four on the

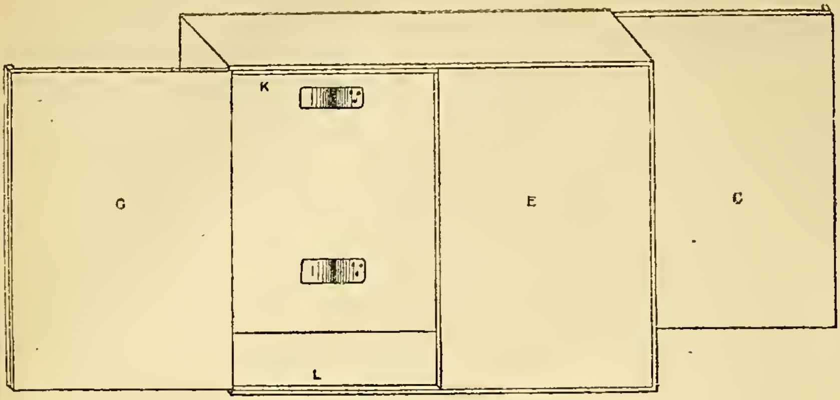


FIG. 62

FIG. 63

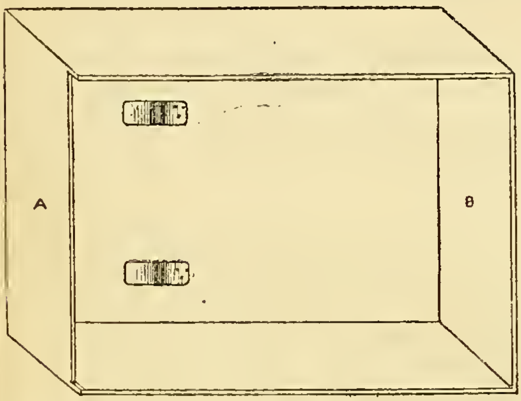


FIG. 64

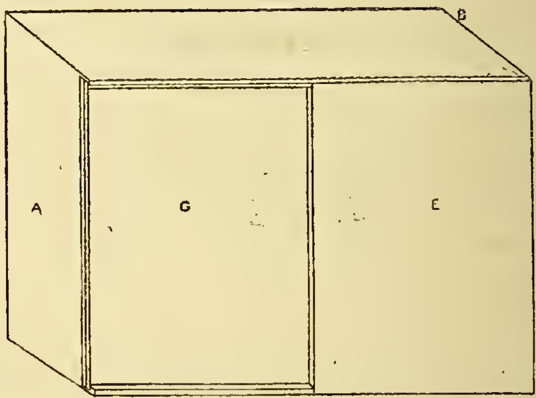


FIG. 61

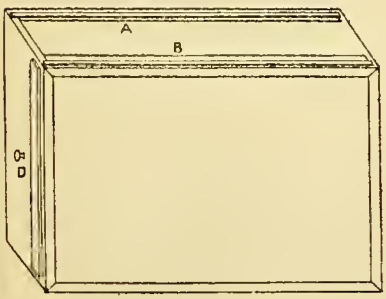


FIG. 67

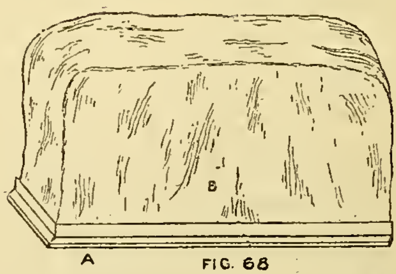


FIG. 68

FIG. 65

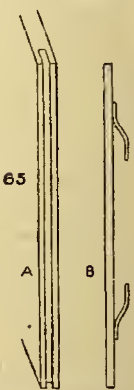


FIG 70

THE DARK SLIDE AND ITS PARTS.

FIG. 61. — THE DARK SLIDE SHOWN AS CLOSED. FIG. 62.—DARK SLIDE OPEN. FIG. 63.—FRONT OF DARK SLIDE. FIG. 64.—INTERIOR OF DARK SLIDE. FIG. 65. ARRANGEMENT FOR PREVENTING ENTRANCE OF LIGHT. FIG. 66.—CARRIER FOR PLATES. FIG. 67.—SIMPLE DARK SLIDE CHANGING BOX. FIG. 68. — TOP FOR DARK SLIDE CHANGING BOX. FIG. 69.—FRAME TO TAKE PLATES. FIG. 70.—PINCHING SCREW.

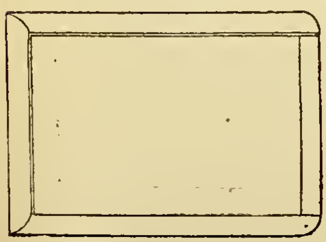


FIG. 69

FIG 66

other side, both shutters being closed, as shown in Fig. 61. The slide is now put into its place at the back of the camera, and the front shutter pulled out ready for exposure, when the springs at the back will push the left-hand lot of plates forward until the foremost of them occupies the place of the drawn-out shutter, being, in fact, only kept in the box by the strips of wood K and L, Fig. 62. The exposure is made, and the back shutter is then drawn out, when the springs shown in Fig. 63, acting against the edges of the plate-holders, will press the right-hand lot of plates backwards, the one at the back occupying the place where the back shutter was just before. The front shutter must now be closed, when it will drive before it the plate just exposed, pressing it to the right, past the springs shown in Fig. 63; and the back shutter being now closed, it will push the plate at the back on right-hand side over to the left-hand side, and all will be ready for the next exposure, there being again five plates on one side of the box, and four on the other as when we began.

Mr. G. V. J. Poirin has, in the *British Journal Photographic Almanack*, described another very simple form of compound dark slide. This consists of the box shown in Fig. 67, with a shutter on each side, and two slots in the top at A and B: a frame, A, Fig. 68, is made to slide in grooves on the top of Fig. 67, and to this frame is fastened a light-tight bag, B. When the frame is in place the slots in the top of Fig. 67 will be covered, and no light should enter them. A small screw, as shown in Fig. 70, should be put on each side, as at D, Fig. 67, and a turn or two of these screws will prevent the plates shaking in the slide, and will keep them up to their registers. Holders must be made to take the plates, but each holder must be made simply as a frame, without any back, as shown in Fig. 69, and must take two plates back to back with a piece of black paper between them. To use this slide, the plates in their holders are inserted through the slots and the cover put on; a plate on each side of the slide is then exposed, as with the usual double dark slide; the screw at D is then turned and the plates released; and the slide being turned partly over, the two plates in their holder on side No. 1 are slipped through the slot A into the bag, and so transferred to side No. 2 through slot B. The screw, D, is now again tightened, and there will be a fresh plate ready for exposure on *each* side. The plates are thus worked from No. 1 side to No. 2 side, till all have been exposed.

In making these slides it will be found best not to attempt to bring the plates into register with the ground glass, but to alter the latter to register accurately with the plates when the dark slide is finished.

(*To be continued.*)

MY FURNITURE, AND HOW I MADE IT.

By MARK MALLETT.

VI.—MY OWN CHEST OF DRAWERS.

IT was not till near upon the year 1700 that the chest of drawers became known in ordinary English homes as an article of bedroom furniture; but when once introduced, its superior convenience caused it speedily to supersede the large, cumbrous, and unhandy chests in which our ancestors had previously been content to store their apparel. As regards appearance, it was not indeed so picturesque as the richly carved chests of which, to a great extent, it took the place; but still that age when plainness and ugliness were to be the distinguishing characteristics of English furniture had not yet arrived, and many of the earlier chests of drawers are artistic when compared with those of later date. In a model frequently followed at this period, the lower drawer or drawers, were wider and deeper than those which rose above them; and the whole was raised some distance from the floor on a stand, often elaborately ornamented with turned-work.

It was somewhat upon this model that I proceeded in making My Own Chest of Drawers, and founded the design shown in perspective in Fig. 43.

From this drawing it will be perceived that a chest of drawers thus constructed is higher in proportion to its width than the ordinary modern form. Its top is, therefore, less adapted to the purposes of a table; but, on the other hand, its drawers will be found easier of access than if they approached the floor more nearly. The chest before us stands 4 feet 4 inches high, its greatest width is 3 feet 4 inches, and its greatest projection 1 foot 10 inches.

For convenience of removal its broad and narrow parts are made entirely separate. The latter merely stands upon the former, and is kept in place by the moulding which is seen skirting its base at front and sides, and which is fixed to the top of the lower portion. The upper part is exceedingly simple and straightforward in its construction; we will therefore deal first with the lower part, which, for distinction, we may call the stand, and which will require more explanation and illustration.

One of the ends, then, of the stand is shown in Fig. 44. It is of inch board, and as it is 22 inches wide, two or more breadths will have to be joined to make it. The length of these pieces will be $21\frac{1}{4}$ inches. They will be partly braced together by the ornamental moulding marked A in this figure, but chiefly by that ledger which is marked H in the plan, Fig. 45, and which is 2 inches wide; partly also by the top (B, Fig. 44), which is screwed downwards into them, as

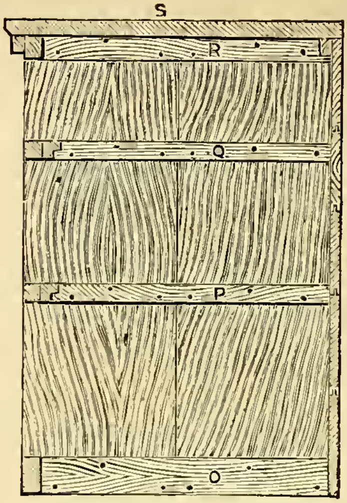


FIG. 48.—INSIDE OF END OF CHEST.

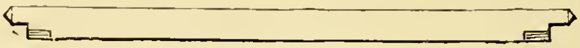


FIG. 49.—BAR BETWEEN DRAWERS.

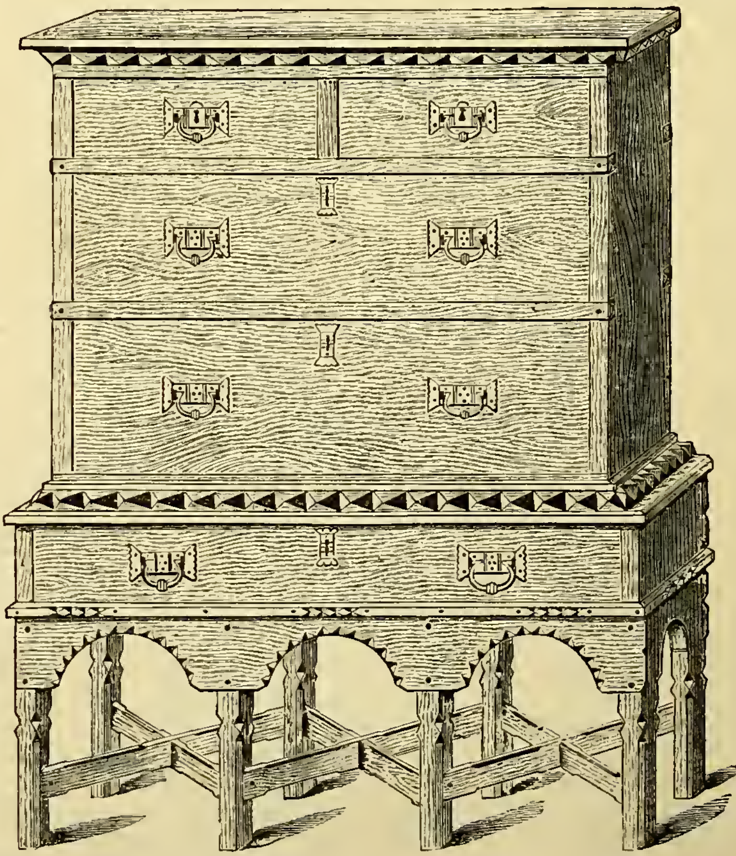


FIG. 43.—CHEST OF DRAWERS ON STAND—PERSPECTIVE VIEW.

well as by dowels. The elevation shows how the lower part of the end is hollowed out, and made to form two legs, each 3 inches wide. The stand will be supported on eight legs—two like these at each end, and four intermediate ones formed of separate pieces. At E in this same figure (44), it will be seen that a cut has been made in the front edge to admit the end of the ornamental front-board (drawn at Fig. 46). This cut, as will be seen by the dotted lines, extends upwards under the ornamental moulding A. Opposite to it in the back edge is another and longer cut for the end of the back-board, which reaches upwards behind the back of drawers to the top. These two boards are three-quarters of an inch thick; the front one is 6 inches, the back one 11 inches wide. They are 3 feet $4\frac{1}{2}$ inches long; half an inch, that is, more than the general length of the stand. This is to allow of a quarter of an inch projection at each end to be finished off as shown in the diagrams. If these ends were finished flush with the plane of the adjacent woodwork, the effect would be unsightly; the arrangement adopted renders them decorative rather than otherwise. Fig. 46 is a working drawing of half the front-board. The dotted line at Z shows how far downwards it will be covered by the ornamental moulding.

In the plan of the framework below drawer (Fig. 45), we see how the front-board I, and the back-board J, join the end-pieces, K, K, and how the ornamental moulding, B, runs in front of and on a level with the upper edge of the former. We also see how the crossbar, M, is attached to the upper ends of the inner legs, N, N, which it serves to steady. It has also to serve, together with the ledger, H, as a runner for the drawer to travel upon.

Of the eight legs of the stand, the four outer ones are, as we have seen, merely continuations of the ends. The four inner ones are strips of inch wood, 3 inches wide by $21\frac{1}{4}$ inches long. These are left square above, and below are bevelled ornamentally, as shown in the various diagrams. The upper part of their outer edges has to be cut away in the same manner as at E and F, Fig. 44, to let in the front and back-boards. Three inches above the floor line the legs are secured in their places by diagonal braces, drawn in the plan, Fig. 47. These braces are bevelled off in the manner shown, to render them more sightly; each is half cut through in the centre to allow the pair to cross each other; and are fastened to the legs by round-headed

screws. The top of the stand (B, Fig. 44) has to bear the whole weight of the upper part of the chest and its contents, and therefore requires to be of considerable strength. Three-quarter inch board must therefore be used for it. This three-quarters of an inch added to $21\frac{1}{4}$ inches, the height of the legs, etc., brings the total height of the stand to 1 foot 10 inches. The top projects three-quarters of an inch beyond the planes of the front and ends, and its upper edge is slightly bevelled off as shown. It has to be strongly screwed down to the ends and back-board. Along the front and ends of the top, and with its inner edge placed 2 inches back from the planes of the front and ends, is the moulding which confines the upper part of the chest. This moulding also serves the decorative purpose of leading the eye gradually from the broader to the narrower part of the structure. The dotted line at G, Fig. 44, shows the limit of the inner edge of the moulding, and the line formed by the front of the upper part of the chest

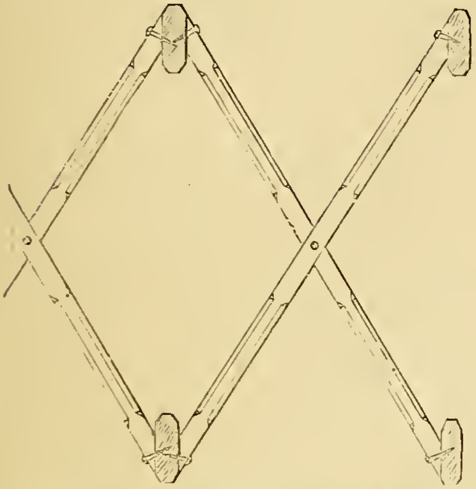


FIG. 47.—PLAN OF DIAGONAL BRACING OF STAND.

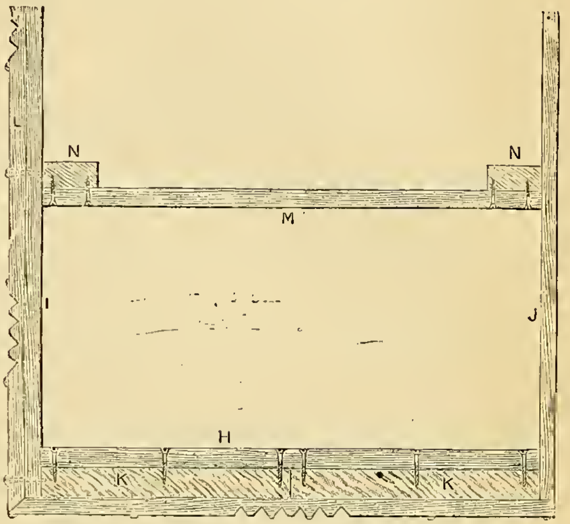


FIG. 45.—PLAN OF STAND JUST BELOW DRAWERS.

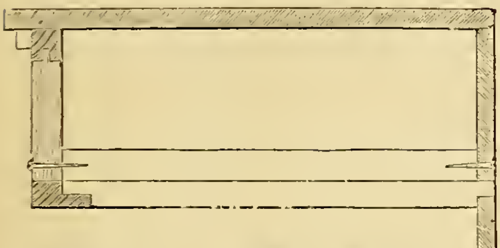


FIG. 50. — CENTRAL RUNNERS OF SMALL DRAWERS AT TOP OF CHEST.

FIG. 51.—SECTION OF CENTRAL RUNNERS.

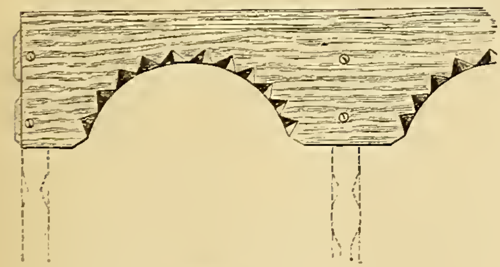


FIG. 46.—FRONT BOARD OF STAND.

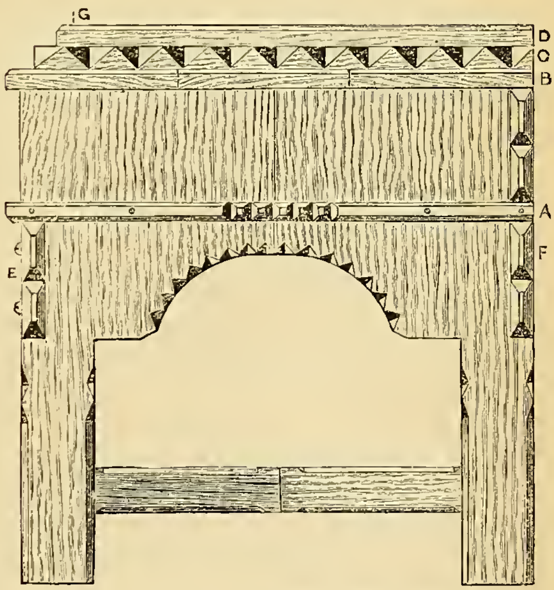


FIG. 44.—STAND FOR DRAWERS—END ELEVATION.

The moulding is composed of two members. The lower, C, is a strip 1 inch by $1\frac{1}{2}$ inch, whose outer and upper edge is notched as shown, for the purpose of obtaining an easy and simple enrichment. The upper member, D, is three-quarters of an inch square, and has its upper outer edge simply bevelled. This moulding is screwed down to the top.

We now come to the upper portion which we may speak of more particularly as the chest. The end pieces for this will also be of inch wood, as were those below. They will be 2 feet $5\frac{1}{4}$ inches long, and the width of the end is $19\frac{1}{2}$ inches. The inner side of one of the ends is shown in Fig. 48. It will be observed that in its front edge four openings have been cut, one inch deep, to admit the ends of the divisions between the drawers, and those of the top and bottom front pieces; for the ends of these pieces, like those of the back and front-boards below, are brought through and made to project a quarter of an inch beyond the ends, and are there finished in the same pyramidal form. At the back also, the half-inch matchboarding is laid horizontally, and whilst in general it comes flush with the outside plane of the ends, in those places just opposite to the projecting ends of the front pieces, it is allowed to project a quarter of an inch as they do, and is finished in the same manner, as may be seen in Fig. 43.

The three lower ledgers, O, P, and Q, serve as runners for the drawers; the upper one, R, supports the top. They are all of inch wood. O is 2 inches wide, and the front piece, which comes against it, is of the same width. This, however, shows but little in Fig 43, as it is almost hidden by the base moulding. This front piece mainly holds the lower part of the chest together, as there is no bottom.

The two middle ledgers, P and Q, are 1 inch square. Their front ends are joined by those front-pieces which divide the drawers, and are arranged for those pieces to rest upon them. The lower side of one of these pieces is drawn in Fig. 49. It is an inch thick by 2 inches broad; and this diagram shows the manner in which it is cut to rest on the ledger.

The upper ledger, R, is an inch and half wide, and is joined at either end by front and back-pieces of the same width. Into this back-piece the top of the back matchboarding will be screwed, and through it, as well as through the ledger R, and the upper front-piece, strong screws will have to be driven upwards to secure the top, S, through which we cannot screw downwards, as it is necessary to keep its upper surface smooth and uninjured; unless, indeed, the workman should choose to cover it with American leather cloth, and finish it at the edges in the same manner as the dressing-table or pedestal cupboard described in previous articles.

In Fig. 50 we see how the upright division between the two small drawers is fixed. Its upper end is mortised into the piece above, its lower end rests against the side runner of the drawers, and is screwed to it. The runners of these drawers are shown in this figure, and also in section in Fig. 51. The lower one rests in front on the dividing bar between the upper and second drawers, and behind is mortised through the matchboarding of back. The upper one is screwed to it.

The top (S, Fig. 48) is of three-quarter inch boards, which may be fastened together by ledgers beneath. The manner in which the top is screwed in its place has been mentioned above. It projects beyond the chest at front and sides an inch and half. Its lower edge is bevelled off, and beneath it is screwed a strip of notched moulding, the counterpart of that at bottom, except as regards size—this being only three-quarters of an inch square.

Of the construction of the drawers, nothing remains to be added to the remarks made on those of the wardrobe in the last article.

Figs. 44, 45, 46, 47, 50 and 51, of the diagrams which illustrate this design, are drawn to a scale of one and a-half inch to the foot; but Figs. 43, 48 and 49, are on a scale of one inch to the foot only.

(*To be continued*).

HANDY WORK IN FARM AND GARDEN.

By GEORGE EDWINSON.

VIII.—THATCHING—THATCHING MATERIAL AND IMPLEMENTS.

ALTHOUGH the picturesque wooden cottages of village homes, with their heavy thatched roofs, are fast disappearing before the innovations of modern improvement, there are enough of them left to illustrate the thatcher's art and keep alive his ancient trade. And, when all the villages of England have been modernized with model cottages roofed with slates or tiles, there will still be work for the thatcher on the roofs of farm buildings, and in protecting the ridges of corn stacks or hay ricks. It is true that even here the inventive innovator has intruded his handiwork, in the shape of thatching machines, rick cloths, and permanent roofs, but the small farmer will not be able to adopt the modern methods for securing his crops under shelter, and will fall back on the good old methods of thatching. I am not prepared to recommend thatched roofs to farm buildings, although much may be said in their favour on the score of warmth and comfort in winter. Slate

covered roofs are more economical, healthy, clean, and enduring than thatched roofs; but I write for a world-wide constituency of readers, and know that slates cannot be readily procured in some parts of the world, whilst in most places some kind of thatching material can be easily and cheaply obtained. This being so, I shall have much pleasure in telling all whom it may concern, how to prepare and use the material for thatching.

Thatching Material.—The best material known to me is wheaten reed, prepared in the manner familiar to West of England farmers. This is superior to a similar material made out of combed wheaten straw, or of wheaten stubble; but the latter is probably the best substitute for the real article. Reeds of other plants may be utilised for the purpose, among which may be mentioned oat, rice, rye, barley, tall flowering grasses, rushes, etc. My foreign and colonial readers may know of other suitable material, such as palm leaves, ferns, or the small twigs of canes and bamboos; but I shall confine my attention in this paper to the preparation and use of the material preferred by English farmers.

Wheaten Reed.—This is the long straight unbroken stem of the wheat plant, specially prepared in the following manner: Straight well-grown sheaves of wheat are selected wherever practicable. Stunted growths are usually avoided, and also weak plants grown in damp, shady localities. The stems should be at least three feet in length, and uniformly stiff throughout. The corn may be threshed out by hand on a threshing floor with a flail, or it may be threshed out in a machine by a special method, *i.e.*, instead of allowing the straw to pass through the machine in the usual manner, it is held back by the workman, and withdrawn after the ears of wheat have been cleared of their grain. To do this successfully, the machine must be driven at a moderately slow speed, and the untied sheaves laid in a well-arranged heap on the left side of the workman. From this heap he takes a double handful of wheat and presents the ears carefully to the mouth of the machine, allowing the heads only to be drawn in, and withdrawing them when the machine is nearly stopped by being apparently choked with the corn. The threshed handful is then carefully placed on his right hand ready for combing, and the work is continued until a large pile of reed has been prepared. In this way as much wheat may be threshed in an hour, as two ordinary workmen would thresh by hand in one day. The reed thus prepared must now be combed to make it fit for thatching, the reason for the necessity of this process being the existence in the reed of a number of flags, or the leaves of the wheat plant, which would, if left in the reed, tend to absorb moisture, and thus impair the waterproofing qualities of the material. The comb in general use for this purpose is illustrated at Fig. 87, from which it will be seen that it is a short handled rake fitted with curved steel teeth, having an oblong section, as shown at Fig. 87A. The head of the comb is made of ash, oak, or some other tough wood; dimensions, 8 inches by $1\frac{1}{2}$ inches by 1 inch, fitted with six steel teeth, as shown at Fig. 87, each tooth being 6 inches by $\frac{1}{2}$ inch by $\frac{1}{4}$ inch, and placed at intervals of 1 inch apart. The handle of the comb should be about 6 inches in length, and $1\frac{1}{2}$ inches in diameter, and should have a guard or shield of leather attached, as shown by dotted lines in Fig. 87. The reed to be combed is suspended by a rope to a combing post, as shown at Fig. 88. The rope should be 3 feet in length, and $\frac{1}{2}$ inch in diameter, and be fixed to the post at one end, at a height of 6 feet from the floor. The combing process is as follows: Take a large double handful of reed from the pile, hold it loosely under the right arm, and set it two or three times on its stubble end to bring all the ends of the reeds flush and even; then place the ear ends on the left arm, grasp the rope with the left hand under the ears, draw it under, take the end of the rope in the right hand, pass it around the reed, make a half-hitch with the looped end, and draw it tight with both hands, thus firmly suspending the handful of reed with ear ends uppermost to the post, as shown in Fig. 88. The looped half-hitch of the rope must now be held between the fingers of the left hand, and this hand made to keep the knot firm whilst the right hand is engaged with the comb in removing all flags and short straws from the reed. If too many short straws are drawn, and the handful is sensibly diminished in size, it will prove that the rope has been placed too near the ear end of the handful, or has not been firmly held. When the handful has been sufficiently combed, it must be taken down, again set it on the stubble ends to bring these even, and laid on a small band of the reed, ready for tying into bundles. Reed for thatching is made up into small bundles of about 7 inches in diameter, each bound with a single lock of the same containing about a dozen straws. Such bundles are named in Cornwall, "lyners," and seven "lyners" are bound together in a larger bundle, named a "wad," or half sheaf of reed. In Devonshire the smaller bundles are named "wads," and the larger bundles, "nitches." In some other parts of England the small bundles are named "yelvins," and the larger ones "stelches." Throughout this article, to save confusion, I shall adopt the Cornish system, and name them respectively "lyners" and "wads." The general rule as to the size of these is: One double handful of reed makes one "lyner," seven "lyners" make one "wad" of reed weighing 20 lbs. The Devonshire "nitch" of reed weighs 28 lbs.

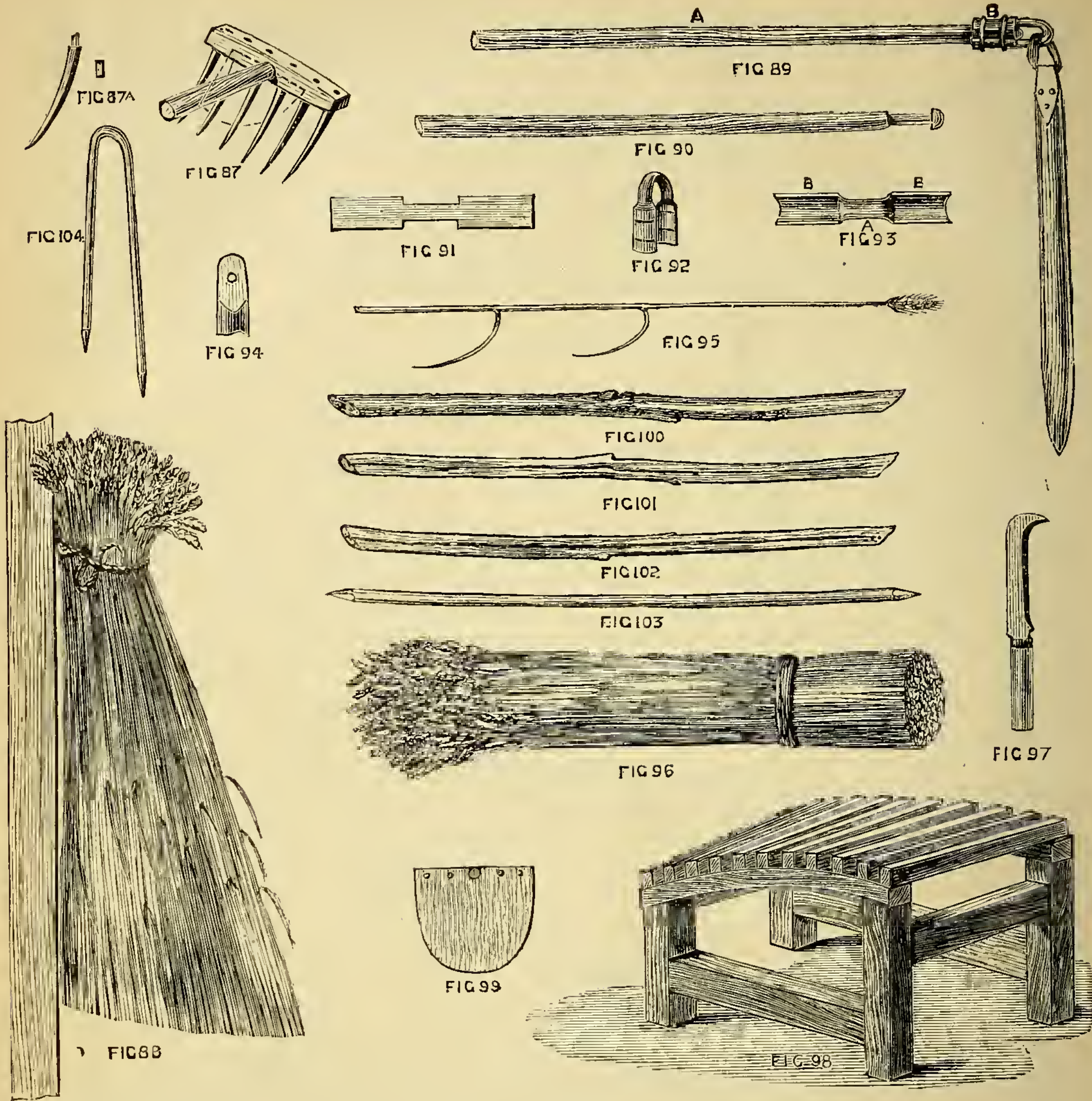


FIG. 87.—REED COMB. FIG. 87A.—TEETH OF COMB. FIG. 88.—HANDFUL OF REED READY FOR COMBING. FIG. 89.—FLAIL. FIG. 90.—HANDLE OF FLAIL. FIGS. 91, 92, 93.—SWIVEL IN SEVERAL STAGES. FIG. 94.—EYE END OF SLASH STICK. FIG. 95.—WHEAT STRAW, SHOWING FLAGS. FIG. 96.—LYNER OF REED. FIG. 97.—SPEAR HOOK. FIG. 98.—THRESHING HORSE.

Hand Threshing.—Hand threshing by means of a flail is of very ancient origin, and was in practice among the Israelites in their own land. As it is a process of separating the grain from the straw, well suited to the needs and the ability of amateur farmers, and is also one most suitable to the preparation of wheaten straw for reed, I will give details of the method and the instruments employed in it. The principal instrument used, is that illustrated complete at Fig. 89, with the detailed parts, 90 to 93, and named a "flail." The essential parts are the handle, swivel head, and slash stick. The handle should be a stout, straight, whole stick of some tough wood (such as ground ash or hazel), resembling a broom handle in form, length, and diameter, *i.e.*, 36 inches by $1\frac{1}{4}$ inch, and must have a head carved to it for the swivel, as shown Fig. 90. The swivel is formed of such tough wood as elm or ash, in the following manner: A piece of tough young wood 9 inches in length by 2 inches in diameter, is split into two equal parts, one of which is shaped as shown at Fig. 91, this is further carved into the form shown at Fig. 93, in which it will be seen

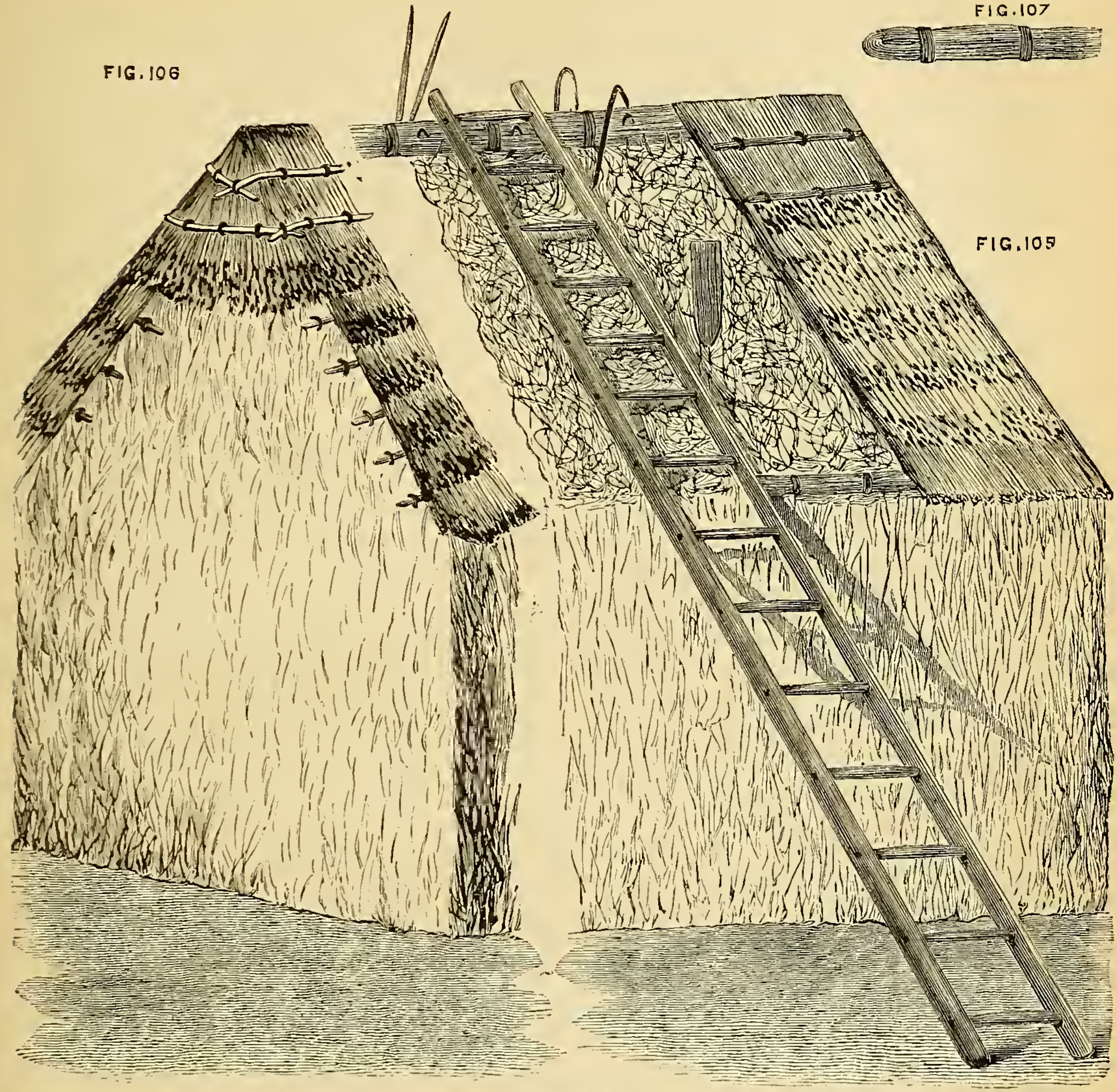


FIG. 99.—LEATHER GUARD FOR COMB HANDLE. FIG. 100.—SPEAR STICK. FIGS. 101, 102.—SPEAR STICK, SPLIT. FIG. 103.—THATCHING SPEAR. FIG. 104.—SPEAR BENT READY FOR USE. FIG. 105.—SPEAR THATCHING: HOW TO THATCH A HAY RICK. FIG. 106.—HOW TO FINISH THE END OF A HAY RICK. FIG. 107.—EAVES WAD.

that the two ends, B, B, have been hollowed out to form the socket, and the part A has been thinned to form the neck of the swivel. This having been done, the neck is to be exposed to the action of steam until it is pliant enough to be bent to the form shown at Fig. 92; it must then be bound together with cord until firm and dry, when it must be carved to fit the head of the handle. It should be noted in carving those parts, that the shoulders must not be left sharp, but should be rounded or tapered both on the head of the handle and in the inside of the swivel; this is done to obviate fracture of the parts, and excessive friction in working. The swivel is sprung apart sufficient to force it over the handle head, and is then bound thereto with tough copper or brass wire, or thongs passing around it in two grooves cut for the purpose. Some owners of flails have the swivel made of iron or steel, working on a steel pin attached to the handle.

The slash-stick of the flail should be of holly, well seasoned, and shaped as shown at Fig. 89, C. Its length should be 30 inches, its diameter in the largest part $2\frac{1}{4}$ inches, or as much as a man can grasp in his

right hand. The upper part of the smaller end should be made wedge-shape to receive the leather eye, or an eye may be pierced in the wedge-shaped end, instead of a separate eye, as shown in Fig. 94. Some makers always pierce a hole in this manner through the slash-stick, and tie a leather eye to this part by means of thongs passing through the eye and around the leather, others merely suspend the stick by means of thongs or strips of horse leather to the swivel, whilst others adopt the plan shown in my sketch, namely, secure an eye of stout horse leather to the slash-stick by means of copper rivets passing through the wedge of the stick, and hang the stick to the swivel by means of stout thongs of horse leather. It is most important that those parts are made perfectly secure, because they have to bear a great jarring strain whilst in use, and a rupture might prove serious in its consequences to the workman. The flail is used for threshing out the corn, and for this purpose is swung around the head of the workman before the stroke is given to the sheaf of wheat. The operation looks simple enough as we watch the operator deftly swing the flail, and keep up the swirling motion whilst he makes the slash-stick strike here or there to right or left on any spot he may choose, and then with a dexterous turn of the instrument strike the sheaf on one side to attack another. But the operator requires some practice before he can train his hands to give a fair stroke and avoid hitting his own head or arms, and still more before he can direct the stroke with such precision as to make sure of driving a nail into the threshing floor.

The threshing floor is not, nor should it be the floor of the barn, but a specially made portable floor, constructed of 1½ inch oak planks securely nailed to transverse supports of oak 3 inches by 5 inches, at distances of 3 feet apart. The floor should be at least 12 feet in length, with a width of 4 feet, and two such floors should be provided. The sheaves of corn are laid in rows on this floor, and are thus placed on a raised platform. When the wheat is threshed out, the sheaves are unbound and the reed is combed and bound up as before directed, when the ear-ends of the "lyners" are spread open like a fan and lightly threshed over the ears to remove the last trace of grain. On most western farms the thresher is provided with a threshing horse, on which he beats out the bulk of the grain before combing the reed, instead of using the flail on the sheaves. The horse, as shown, Fig. 98, is constructed as follows : A stout frame of oak or ash, strongly put together, is bridged by a number of stout ash bars, as shown in sketch. Dimensions of frame : Front, 2 feet 6 inches in height by 3 feet in width ; back, 1 foot 9 in height ; depth from front to back, 2 feet 6 inches ; bars, 1¼ inch by 2 inches, secured by screws in the ends to the frame, and set on their edges 1 inch apart. The threshing horse is used in the following manner : The implement is set with its back near a wall, to prevent the grain from flying away at each stroke, and so wasted ; the thresher unbinds a number of sheaves and arranges the pile near the horse, from this pile he takes a double handful at a time, and brings it down on the ribs of the horse with his full force several times, occasionally shifting the sides of the ears exposed to the ribs, until he deems all the grain to be beaten out. The handfuls are thrown up into another pile to be eventually combed, bound and threshed. The use of this implement is much recommended, as the reed is not broken so much in the process as by that of threshing with the flail. Notwithstanding this, the flail should be used on the lyners after the reed is bound, for there are many small grains of wheat that will not yield to anything less than blows from a flail, and it is most important to free the reed from every trace of grain, not only for the sake of its value, but also to prevent a green thatch in moist warm weather.

Thatching Spears or Spars.—The reed thus prepared, is laid in even rows in layers along the roof of the stack, rick, or house to be thatched, and is secured thereto by a number of bent sticks resembling large hair-pins, thrust through the thatch into the corn or hay beneath. These bent sticks are named thatching spears or spars, and are made in winter time or rainy weather by men, in the following manner : Hazel and withy sticks of from ½ inch to 1½ inch in diameter, cut from hedges and made up into bundles as directed in the present volume, page 18, are split by means of a small hook, named a spear hook, shown at Fig. 97, into two, four, or as many sections more as may be necessary. The spear maker sits on a low seat, and holds the stick across his knees, with the stout end to his right ; into this end he inserts the edge of his hook, and by a judicious system of leverage to right or left, splits the stick along the course of its pith into two equal sections as shown in Figs. 101 and 102. If the two halves will admit of being split again into two half-inch strips of triangular section, this is next done, and the several sticks are sharpened at the ends by means of two or three oblique cuts with the hook given to each end ; the finished spear being shown thus sharpened at Fig. 103. Spears thus made, are made up in bundles of 100 spears, and stowed away in a cool dry place until wanted.

Thatching Ricks and Stacks.—The thatcher takes the rick of hay, or stack of corn, over from its maker with the ridge or roof made up for thatching, but he has to prepare it for his own purpose. As there is no ridge pole, he must make a substitute in the shape of

a ridge wad, that is, a long thin uniform bundle of straw or old reed, stretching from end to end of the ridge, and secured thereto by means of some long spears. The diameter of this wad should be similar to that of a lyner. Whilst he is preparing this, the wads of reed should be well soaked with water, and the bundle of spears also put into water to freshen them. Unless the reed is thus damped, it will slip from the roof before the thatcher can secure it in its place, and the spears will, if dry, break when an attempt is made to bend and twist them. Commence the work at the end of the rick or stack, if of oblong form, and work to left from the right hand corner of the ridge. First, pin a lyner of reed with its stubble end downwards, at the extreme right hand lower corner end of the ridge, by means of two or three spears; then proceed to pin the next with its ears down over the first to within seven or eight inches of the stubble end ; follow this on with others in order, until a file of lyners extends upwards to the ridge wad, and clearly defines the end of the ridge. Next erect the ladder to lie on the ridge parallel with the file of lyners at a distance of two feet. Take up a wad of reed, a number of spears twisted and bent as shown Fig. 104, and a small bundle of reed 2 feet in length and 3 inches in diameter, bound with two bands, technically named an "eaves-wad" (Fig. 107).

Pin the "eaves-wad" to the extreme edge of the ridge to form the eave by means of two spears, then unbind a lyner and spread the reed (with its stubble ends overlapping the eaves-wad some three or four inches) from the side of the ladder to the lyner pinned to the corner end of the ridge as before directed. Now lean over and unbind the lyner, secure the upper end of its band with a spear, and blend its reed with that already spread. Next, lay a spear along across the spread reed, halfway between ear and stubble, and secure it there by means of three or four spears. Then take a few steps down the ladder and cause all the stubble ends of the reed to form an even edge or eave, by driving in the uneven heads with a bat or strip of wood. Again mount the ladder and spread another lyner of reed with its ear ends downwards, overlapping the first layer down to within seven or eight inches of the stubble end, and entirely hiding the spears which hold the first in place. Thus proceed upward, spreading each layer of reed regularly and blending them with the end lyners, until the ridge-wad has been reached. At this point, the top layer of reed must be made to overlap the ridge-wad, and the stubble ends should be left to protrude slightly over the wad (they can be struck back when the top layers on the other side of the ridge are laid to these), the top layers are also secured in place by means of two spears secured at distances of one foot apart, as shown, Fig. 105. When the first row has been secured, shift the ladder two feet further to the left, and proceed with another eaves-wad, and a succession of layers as at first, always being careful to blend the reed of each row, or stelch, as it is sometimes called, with that of the last laid, and also thrust the end of the transverse spear into the eye of the bent spear, which holds the end of that on the last layer. Each layer of reed must be of the same thickness throughout (from 2 to 2½ inches), and this uniformity must be specially ensured at the eaves, whilst these also should be perfectly straight from end to end of the stack. In blending the stelches, avoid leaving any marks to indicate the union, and also clear away all litter from the finished stelches before the ladder is shifted. The ends of the stack are to be finished when all the other parts of the ridge are covered. The method of finishing is clearly shown in Fig. 106. Bent and twisted spears are used transversely, instead of straight spears, to ensure a rounded contour to the ends. Some thatchers use here, and also in all other parts of the work, twisted brambles instead of straight spears as transverse binders on the layers of reed. Others make ropes of straw, and use these transversely as binders. This latter method is known as "rope thatching." There are various other methods and varieties adopted in other English counties, but I have not space for a notice of them here. I know from experience that good spear thatching, as herein directed, is all that can be desired for neatness, security, and durability. I have not been able to give directions in this paper, on the subject of house thatching, but this has been ably dealt with by Mr. Arthur Yorke, in one of his papers on "Rustic Carpentry," AMATEUR WORK, Vol. II., page 377

(*To be continued.*)

LITHOGRAPHY FOR AMATEURS.

By H. E. GRANTHAM.

V.—KEEPING ROLLER IN ORDER—LANHAM ROLLER.

ONE of the greatest difficulties that the amateur has to contend against is the keeping the roller in proper condition. Constant and regular work, with daily scraping, is the only way of keeping it in really good condition. Professionals, if they have to leave a roller out of use for long, cover it, after scraping, with tallow, by rubbing it with a farthing dip, as described in preparing a new roller. This has the drawback of being very difficult to scrape entirely off again, and the presence of the tallow is apt to make the ink so greasy that it is difficult to keep the

work in proper condition. When the roller has to be laid on one side for months, perhaps, to rub it with tallow is the only way I am acquainted with that can be relied on. If possible, print a "heavy" job on resuming work with such a roller, treating it in a very similar manner to a new one. When the roller is laid on one side for a week or two only, it can be kept in very fair condition by having a dose of strong varnish after being scraped; then a piece of thick paper is wrapped round it to keep off the air. On resuming, scrape well, and give it a night's soaking with a *little* "middle" varnish, and scrape again before using, printing with stiffish ink.

About the year 1877, a kind of roller, called the "Lanham Patent Victory Roller," was brought before the trade. I purchased one for use as a colour roller at press, and it has given great satisfaction. I simply thoroughly wash the ink on the roller with paraffin oil, scrubbing it with a tooth brush to loosen the ink; wipe off with a rag; another scrub is then given with the oil, another wipe off, and a final wash with turps. When after being well wiped off with the rag, I simply place the roller in the usual place it is kept in. The makers still make the rollers, though not quite the same, but they state that they are equally good. They cost about the same as leather rollers, but are ready for use on being unpacked. The makers are the Proprietors of the *Daily Telegraph*, Fleet Street, London. The chief drawback to the use of these rollers is that they cannot be scraped, and the only way to remove ink from them, when they do not need to be "cleaned," is to scrape the inkslab with the palette knife, knock the roller up, and repeat until sufficient ink has been removed from the roller. When I use the roller for two or three days together, I simply add a little varnish to the ink on the roller, and give it a good knocking up. In the morning I scrape the slab, knock the roller up, again scrape, and repeat until I have got sufficient ink off the roller, when I add some of the proper ink and proceed with the printing.

The qualities that the Lanham roller possesses make it a very suitable roller for the use of the amateur, as, when cleaned, it can be put into a box and left for any reasonable length of time, and is ready for use at any moment.

In the foregoing chapters I have treated only of printing in black, that being the colour most printing is done in. I trust that my readers may derive benefit and find them of assistance to them in overcoming the inevitable difficulties connected with the art of lithographic printing, even in its simplest form. There are so many unexpected difficulties that crop up in the printer's way, that written instructions for every possible contingency would be so verbose as to be almost unreadable, and there is often no saying, even to a practised hand, what is the exact cause of a job going "cranky." The merest trifle is often sufficient to convert a nice job into one that will give no end of trouble to keep in good order. It is necessary for all who try their hand at lithographic printing to be very careful to keep the sponges and damping-cloths clean by frequent washing in clean water only. Never use soap to wash anything; the slightest touch of grease in sponge or cloth is quite sufficient to spoil the best job ever transferred to stone. It is also better, as a rule, to use ink that is a little too stiff than one that is too thin. In my next chapter I will touch on colour printing.

(*To be continued.*)

HOW IT WAS MANAGED.

A SERIES OF PRACTICAL HINTS, SUGGESTIONS, AND WRINKLES.

FROM AMATEURS FOR AMATEURS.

V.—MAGNETO-ELECTRIC MACHINE.

[*From* CHEMICUS.]

MR. EDWINSON, in his paper on the above, Vol. II., page 551, directs the coil bobbins to be made of iron and turned. As many amateurs may be unable to make them as directed, I wish to suggest a simpler method, and one adopted by some of the London makers. Instead of the bobbin being of iron, it is made of bone or boxwood, and the iron core faced with a plate of iron. The accompanying sketch will explain: B is the plate of iron attached to core A, corresponding to one of the flanges of iron bobbin; C is the bone or boxwood bobbin, it is made with one flange only, D, which goes next the core holder. A piece of leather is put on the opposite end to insulate wire from iron.

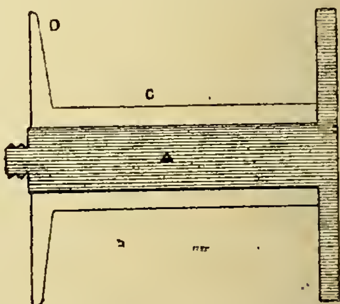


FIG. 3.—SECTION OF COIL BOBBIN.

VI.—A MEDICINE CABINET.

[*From* L. S. D., *Jamaica.*]

I have noticed a request for a design for a medicine cabinet from NOEL in page 310. Will you allow me space to describe my experience in this matter for NOEL's benefit, and to give a sketch of my cabinet, which may be useful to him and to other readers of AMATEUR WORK?

Some time ago I came across an old piece of furniture (nearly 100 years old) from which I took the design shown

in Fig. 4. It was originally intended for a medicine chest or cabinet, but with some alterations it might be made useful as a cabinet for shells or other curiosities, or even a bookcase or tool cabinet. The sketch is drawn in parallel or isometrical perspective—which gives the best idea that can be obtained in a single sketch—on a scale of ¾ inch to the foot.

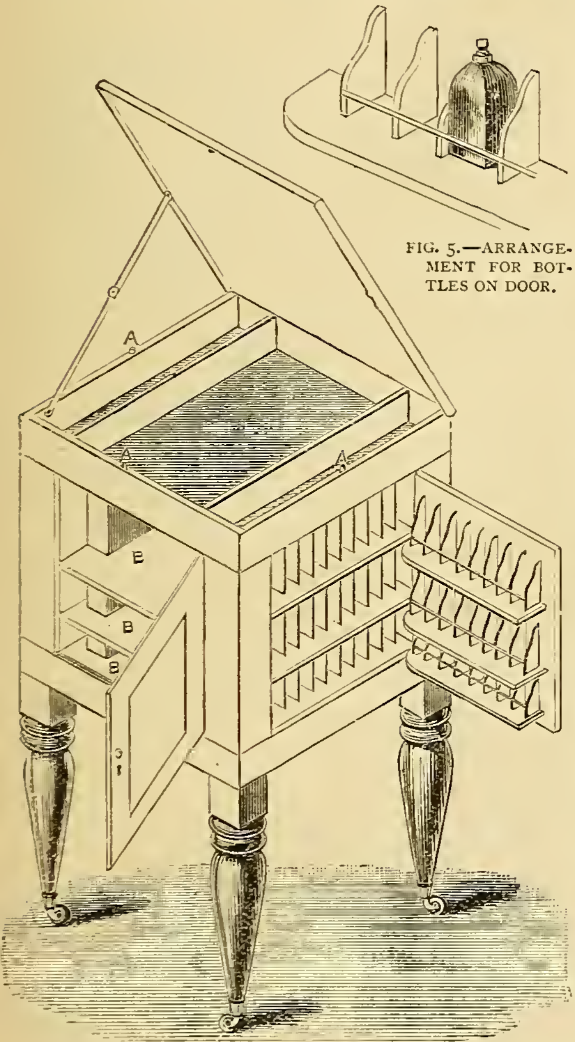


FIG. 5.—ARRANGEMENT FOR BOTTLES ON DOOR.

FIG. 4.—DESIGN FOR MEDICAL CABINET, SHOWING INTERIOR.

The design is for a cabinet four feet high and two feet square, but it can be reduced or enlarged to any dimensions desired. The shelves and partitions can also be altered to suit any sized bottles. I should recommend anyone who determines to make it, first to decide on the quantity and variety of drugs he means to keep, and make his cabinet in size and fittings to suit his bottles. A narrow rail or slip, shown in Fig. 5, runs in front of the bottles on the doors, to keep them from falling out when the doors are opened. The left hand side has a door and fittings similar to that on the right, where the door is shown open. The centre compartments can also be fitted for bottles or made to carry drawers if so desired. The three doors are fastened, when closed, by pins (marked A) running through the framework into them, and the whole cabinet is secured by a lock and key to the lid. The left hand side and door is constructed and fitted up in the same manner as that shown open on the right. The parts lettered B can be fitted with drawers if desired.

NOTES ON NOVELTIES.

By THE EDITOR.

45. MELHUISH'S NEW CATALOGUE. 46. CRUTES' PATENT CONCAVE FLOWER-POT AND PATENT CAP.

45. MELHUISH'S NEW CATALOGUE. — Time was when a very moderate length and breadth of paper afforded a sufficient superficies for any vendor of goods of whatever kind they might be, to make buyers acquainted with the nature, names, and prices of the articles with which he was prepared to supply them. In these days, however, things are different, for lists of specialties, for which a single leaf, or at the utmost, four pages, afforded space enough, have now swollen into goodly volumes of great bulk, to the advantage of the printer, the paper maker, and the post-office, by whose instrumentality they are distributed. To purchasers, these catalogues, in minute detail, are particularly useful, as they help him to ascertain precisely what he requires, and to ask for it by name and dimensions, thus saving time and trouble, both to the buyer in stating what he wants, and to the seller in understanding his customers' requirements.

One of these useful catalogues, nicely printed and profusely illustrated with hundreds of engravings, has just been brought out by Messrs. R. Melhuish & Sons, 85 and 87, *Fetter Lane, Holborn Circus, London, E.C.*, the recipients of a bronze medal at the International Health Exhibition of 1884, for excellence of tools, for all workers in woods and metals. The extent and importance of this catalogue will be better appreciated when it is said that it is a crown 8vo volume of 272 pages, a convenient size for placing on one's bookshelves, as a handy work of reference: it will be sent to any applicant, post-free, on receipt of 1s.

Of course there are many catalogues of edge-tools and builders' ironmongery that are as well got up and as admirably illustrated, but I venture to think that it would be difficult to find any catalogue of similar character that is so full of detail, and so completely comprehensive of every want that an amateur, or even a professional, workman, can possibly have. One important point in Messrs. Melhuish & Son's statement in their opening address "To Our Customers," is the reductions that have been made in the prices of 1884, in which I think the rates compare favourably with those of any other firm in the same line of business. With reference to lawn-mowers, rollers, and horticultural specialties, I note, in page 15, that Messrs. Melhuish & Sons will supply any maker's machines, allowing the full trade discount from 25 up to 40 per cent., simply claiming 5 per cent.

commission to cover cost of correspondence, etc. This must prove a great advantage to buyers. In pages 36—44, a very complete list of iron planes of all kinds, and the clever and handy spokeshave tools of all sorts is given. In page 50 will be found illustrations and prices of some improved mitre-cutting machines, which seem to be very useful appliances of this class, and in page 61, mention is made of a folding-rule, with a patent joint, which may be bolted straight open or at angles of 45°, 60°, and 90°, a very useful instrument. Pages 75 to 79 contain a price list of the cutlery that Messrs. Melhuish & Sons have recently added to their extensive stock, and which is well worth the attention of those who are furnishing or replenishing a diminished or worn stock. Illustrations and prices of carving tools, showing the width, curvature, etc., of each are given in pages 80 to 84; and in pages 107 to 114, mention is made of the mathematical instruments, colour boxes, and drawing materials, that form another new feature of a stock that is as various as it is select and choice. In pages 128 to 132 are illustrations and prices of handy chests of drawers of all sizes for tools and small articles of ironmongery that the amateur may wish to keep by him. At page 177 we come to what may be termed the second part of the catalogue, from which to the end—nearly 100 pages in all—there is an exhaustive list of cabinet brass foundry and hardware, including iron and brass furniture and fittings of every description, including prices of hinges, latches, nails, screws, etc., of all kinds, sorts, and sizes. But I have only been able to call attention to a few leading items in a catalogue in which every page contains prices and illustrations of several useful articles, and which every amateur should possess.

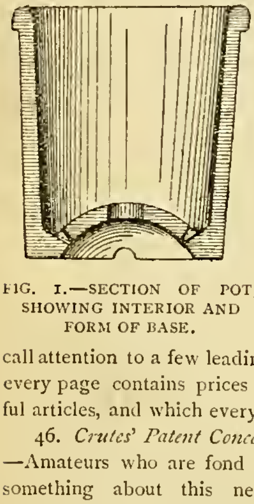


FIG. 1.—SECTION OF POT, SHOWING INTERIOR AND FORM OF BASE.

46. *Crutes' Patent Concave Flower-Pot and Patent Cap.*—Amateurs who are fond of gardening will like to know something about this new flower-pot, which forms a very desirable addition to existing garden and greenhouse appliances of this kind. The flower-pot itself is well made, to judge from the specimen before me, and differs from the ordinary earthen flower-pot, in being straighter in the sides, deeper and wider in the base, consequently if one of the Concave Flower-pots be taken and one of the ordinary shape, both being the same in diameter at the top, the former will be both longer and larger at the bottom, and therefore afford more room for mould and the roots of the plant. This will be seen from Fig. 1, which gives a sectional view of the pot, and shows its interior and the structure of the bottom, which is concave, like the bottom of a wine bottle, and is perforated with a large hole in the centre, and three smaller holes at the sides, which afford an immediate escape for any surplus water when it reaches the channel that encircles the bottom of the pot inside. Fig. 2, which exhibits a view of the exterior of the bottom, shows the relative position of the holes just described and three grooves in the edge of the bottom, which facilitate the passage of the external air into and upwards in the pot, thus ventilating its centre, and tending to induce vigorous plant growth. The Patent Caps, which are shown in Fig. 3, and which resemble small saucers, pierced with five holes at the bottom, and grooved in three places in the upper edge, are used instead of crocks, and before potting any plant one of these is placed inside the pot, on the bottom, and immediately over the large hole in the bottom of the pot itself. The caps may be used with ordinary pots; they induce perfect drainage, save crocking, a troublesome proceeding to many amateurs, and facilitate re-potting, for when a stick with a diameter larger than the hole in the bottom of the cap is pushed through the hole in the bottom of the pot, cap, mould, and plant are lifted out of the pot altogether, and may be easily transferred to another and larger pot, or placed in the ground. The merits claimed for the pot and cap are that by their use flowers and plants may be grown to perfection without trouble, that perfect drainage is provided, the use of crocks is greatly abridged, if not saved altogether, ventilation and aeration in the interior of the pot is secured, and evaporation lessened. It is further stated that insects and worms, through the peculiar construction of the bottom, are prevented from entering the pot; but I venture to think that this is doubtful. It is certain, however, that the construction of the bottom will prevent clogging where the pots are plunged in earth, and thus the pots are therefore especially well suited for plants that are kept within doors during the winter and spring, and plunged in the open ground in summer and autumn. In repotting from these pots, when the patent caps are used, the plant remains erect, and is not turned upside down, or very nearly so, as is the case in taking plants out of ordinary pots. All that is necessary is to place the pot over an upright stick, which should pass through the bottom, when with gentle pressure the plant with the earth intact remains in the hands, the empty pot sliding down the stick. The pots and caps may be obtained of any florist and seedsman in the United Kingdom, or of the patentee, Mr. James Crute, 14, *Knightrider Street*, *London*, *E.C.* The caps are supplied at 6d. per dozen; the sizes and prices of pots per dozen are as follows:—$4\frac{1}{2}$ inch, 9d.; $5\frac{1}{4}$ inch, 1s.; 6 inch, 2s.; 7 inch, 3s.; $8\frac{1}{2}$ inch, 4s. 6d.; 10 inch, 6s.; the size, in every case, being the top diameter. The larger sizes are sold singly; 12 inches at 1s.; 14 inches at 1s. 6d.; 16 inches, 3s. 6d.; 18 inches, 6s.; and 20 inches, 10s. 6d.

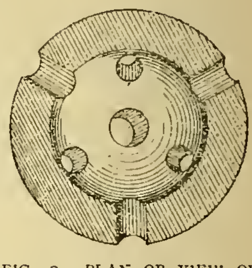


FIG. 2.—PLAN OR VIEW OF OUTSIDE OF BOTTOM OF POT.

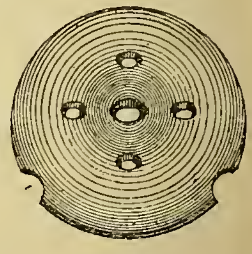


FIG. 3. — PATENT CAP USED AS SUBSTITUTE FOR CROCKS.

AMATEURS IN COUNCIL.

1. *Contributors to* Amateur Work *are requested to write on one side of the paper only, and Correspondents when asking or answering Questions in "Amateurs in Council," are also requested to write on one side of the paper only.*

2. *When Illustrations or Diagrams are necessary, draw them on a separate piece of paper, because the "copy," as the manuscript is technically called, has to go to the printer, and the illustrations to the engraver.*

3. *Abstain from the epistolary form, as it is utterly unnecessary, unless in letters of business. Put the question you wish to ask, or the reply you wish to make, as briefly as possible, and write every separate question and every separate reply on separate pieces of paper. Sign each with initials, nom-de-plume, or name and address, as preferred.*

4. *Let every paper be headed* Amateur Work, *and follow these words with* "Information Sought," *when it is a query;* "Information Supplied," *when it is an answer to a query; and* "Sale, Purchase, and Exchange," *when it concerns anything to buy, sell, or barter.*

5. *It must be fully understood that no attention will be paid to any letter or communication in which these rules are not rigidly observed.*

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine, the information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

A Chance for Somebody.

*** Mr. Thomas Syer, of 1, *Finsbury Street, Chiswell Street, E.C.*, the Principal of the "Finsbury School of Amateur Mechanics," and proprietor of the "Patent Vices, Workbench, and Tool Depot," at the address given above, tells me that he will have a vacancy, at the beginning of September, for an Apprentice, in his Cabinet and Joinery Department. A premium will be required, and letters of application should be addressed as above. Mr. Syer is a first-class certificated master-workman, thoroughly skilled in his calling, and would doubtless mould a willing obedient lad, with ready hands, into as good an artificer as himself. I have much pleasure in pointing out this chance for somebody to the readers of this Magazine.

Dulcimer Makin .

Chopper writes:—"I would be glad if Mr. Gray or some brother amateur would tell me where I am wrong? I bought wire and piano screws for two dulcimers soon after the instructions appeared in Amateur Work, Part 14, page 121, January Number, 1883, but did not begin to make the dulcimers till lately, owing to other jobs which fell out. When I began to work, as near as I could to the instructions, all went pretty well till I began to put on wires. I began with No. 9, and put on seven sets, but on opening the other parcels, I found I had put on the finest wires, which I believed to be the wrong place for them. All the instruments I have any knowledge about are strung with the strongest and heaviest strings at the lowest note, as I found, on looking at wire gauge given in 'Amateurs in Council,' Part 29, page 288. I found that the sizes ran from No. 1, the largest, to No. 26, the smallest; then I concluded the parcels had got marked wrong. I took off the finest wires, and put on the largest, No. 13; as it is also stated that various gauges have been in use, I made inquiries at the shop where I bought the wires, and was informed that they were marked right, so now I do not know which is wrong, for I think I am a very bad judge in music, if the finest wires should be at bottom; and now I have strung it with the finest wires at the top, I cannot get the highest note on the left hand side higher than E in the treble. I have, so far, tuned it with a D flute. I have broken from eight to ten wires in trying to raise the pitch, but I cannot, so far. The dulcimer sounds well, all that could be desired. I have permission to tune it with a piano, but should like the wires right for certain before I do so. The measure of my dulcimer, without the outside cases, are—length of bottom, 46 inches; sides, bevels cut off, 20 inches; top, shortest bevel, 23½ inches; across the middle, 17 inches. I do not quite understand how it should be 17 inches across the middle, when the instructions are given to get a piece of pine 14 inches wide for back and belly, and the iron bridge is to be 14⅞ inches, and let into the top and bottom pieces. I hope some one will be kind enough to clear this matter up. I found that there was not enough No. 13 wire, the thickest, to do more than five sets of the longest wires, so I am in a fog."

Organ Building.

Amicus.—Your suggested improvement in organ actions reminds me of a clever Yankee, whom I have read about somewhere. He invented a machine gun which was to fire off three hundred red-hot balls every minute, as long as a man turned a handle; but the gun had one small fault—the darned handle wouldn't turn!! Well, I guess it would be very useful indeed if the backfalls of the organ action could be made to pull down a valve of one sound-board at its front end, and at the same time, push up the valve of another sound-board with its tail end. But it puzzles me to know how you are going to get your valves to work inside the channels of an ordinary sound-board; what are they to bed on, particularly in the smallest channels, and how will you arrange the springs? It could be done with a singe stop by using a kegellade sound-board, but your sketch and explanation clearly indicate an ordinary channel board, and you suggest having four stops on each sound-board.—M. W.

Gamba.—I would recommend that either a light Trumpet or a Clarinet, carried down with a Bassoon, should be placed on the spare slider of the Great Organ, and that a Dulciana and Oboe should occupy the two spare sliders of the Swell. A Tremulant costs little, and although not much required for church music, would be an acquisition, as at an organ recital, where the scope is not so limited, its use with quiet stops would produce a charming effect, which, I think, could hardly fail to be greatly appreciated. As I am only an amateur, I regret that I am precluded from giving an estimate of the cost of these additions, or of the hydraulic blowing apparatus. Any respectable firm would give much more satisfactory information in this respect.—M. W.

C. H. B. (*Oldham*).—I have read your query over several times, but cannot make out what sort of sound-board you wish to construct. You say it is to have eighty-four channels for seven stops of pipes, each stop containing only twelve pipes, making a total of eighty-four If you have given the number of pipes correctly, you would require only twenty-four channels for a single manual sound-board, or forty-eight for a two manual, as the compass is one note short of two octaves. You should at least complete the two octaves. The only stopt pipes would be those of the Stopt Diapason. Full directions as to scales are given in my first two articles in Vol. II. You can commence at CC, Tenor C, or any other note you like, and carry the scale upwards; but as you give no information as to your starting pipe, I cannot give you its size, or estimate the cost of the instrument.—M. W.

Amateur's Greenhouse.

C. J. N. (*Upper Clapton*).—The greenhouse described in Vol. I. can be built, and the framework put together without difficulty, by an amateur. With regard to cost, measure up from the working drawings that are given, the lengths of the different kinds of timbers required, length of sash bars, etc., and, having taken these to any timber merchant in your neighbourhood, or to the Cheap Wood Company, 95, *Bishopsgate Street Within, E.C.*, you will soon learn for what amount you may obtain them. Then, having measured the area of the parts of the house to be glazed, which will give you the superficial content of glass required, you can easily calculate how many panes you will want of a certain size, either the size recommended or any other that you may determine on. This done, write to Mr. Henry Wainwright, 8 and 10, *Alfred Street, Boar Lane, Leeds*, who will tell you for what sum he can supply the glass you require, with putty, etc. I do not know of any greenhouses whose frames are entirely of galvanised iron. Messrs. Messenger and Co., Horticultural Builders, *Loughborough, Leicestershire*, supply greenhouses whose framework is of wood and iron in combination.

Copying Ink, etc.

Amateur Ink Maker.—You ask for recipes for a "blue-black" ink, and an ink that will copy. I give you the following, but I can in no way vouch for their efficacy, because I have not tried them:—

1. A blue fluid for making blue-black writing ink is prepared by putting 1 oz. of Prussian blue in a bottle, and pouring on 2 ozs. of concentrated hydrochloric acid. Effervescence ensues, and the mixture soon assumes the consistence of thin paste. Let it remain for twenty-four hours, and then dilute with half a pint of water, and keep in a glass bottle.

2. The property of copying may be given, it is said, to any ordinary ink by the addition of sugar or glycerine. One part of glycerine added to one hundred parts of violet or black writing ink will make a fairly good copying ink. Or, take 4 ozs. of copperas, 12 ozs. of nut galls, 8 ozs. of logwood, 8 ozs. of vinegar, 1 oz. of gum arabic, ½ oz. of glycerine, and 48 ozs. of water. Reduce the solid substances to powder, and then boil the whole of the ingredients together for an hour. When cool, strain through a flannel bag, and afterwards filter through a folded filter. Add a drop of oil of cloves, shake the mixture well together, and put into bottles.

Barnes' Velocipede Machinery.

J. H. W. (*Cleveland, Ohio*).—An American gentleman, writing from the town and state that follow his initials, says :—"Permit me to say that your notice of the Barnes' Lathe, made at *Rockford, Ill.*, first called my attention to an examination of it at an agency for the foot power machinery of this company, in this city, and I find it surprisingly above all description, not only for what it can do, but for the ease with which it can be run by the double treadle or velocipede motion. It is a grand success, and will for ever end the backache of many an old-fashioned treader or kicker."

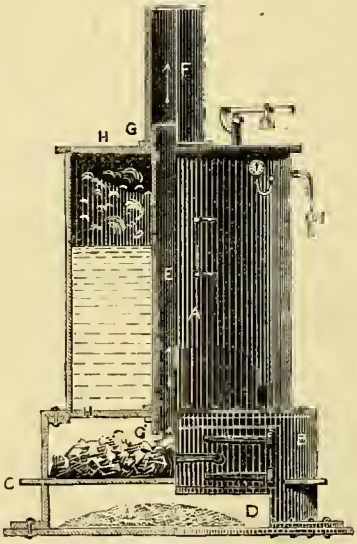
L. S. D. (*Jamaica*) writes :—"With reference to your remarks on the introduction of the above into England, in Part 42, page 355, and Messrs. Churchill and Co.'s letter to you, it is a matter of small importance whether F. W. or myself were the first to call your attention to them, so long as they have, through your able efforts been brought to the notice of your readers, but why Messrs. Churchill and Co. should feel any jealousy on the subject, I cannot understand. If they have had them so long among their varied stock of amateur's appliances, and I do not for a moment doubt it, though I can endorse your statement that they do not appear in their catalogue of 1882, why did they not, by advertising them, or calling your attention to them in 'Notes on Novelties,' as you very properly observe, bring them to the notice of your readers? I first drew your attention to Barnes' Velocipede Movement early in 1883, noticing your reply to E. W. (*Headley*) on Cutting Mouldings, Part 14, page 147; I then recommended E. W. to buy one of Barnes' 'Velocipede Foot Power Formers,' and sent you one of their catalogues. My communication, from subsequent correspondence with you, seemed to have miscarried, and I sent you another catalogue later. Since that date I have seen several applications from your readers for information as to the best machine for cutting circular mouldings, but no notice appears to have been taken of them by Messrs. Churchill and Co. If they had these useful little machines, which are very inexpensive in America, why not have advertised them, or called your attention to them? Messrs. Churchill and Co.'s catalogue is certainly a very exhaustive one, but only suitable for very young amateurs, with a good pair of eyes, or those who possess a microscope; and I would here observe, in the interest of my brother amateurs in the colonies, and other places abroad, that English caterers for amateur requirements, unlike their contemporaries in America, do not seem to believe in the wise adage of 'setting a sprat to catch a whale.' American tradesmen, and in this I think F. W., and others who deal with them, will bear me out, are only too pleased to send their catalogues *free*, all over the world, to anyone applying for them, whereas, in England, a charge is always made. This is very well for residents in England, who can obtain them by enclosing a few stamps, but we poor residents abroad, where English stamps are not to be had, and who, probably, in many instances, have no friends or agents in England, have to do without them, and the more liberal Americans get our custom. With regard to the Shipman Engine, Messrs. Churchill and Co. say they had them '*some months ago*,' it has been in the market for nearly two years, and even in this out of the world place (*Jamaica*) they have had an agent appointed since the beginning of the year." [Messrs. Churchill and Co. have a large edition of their Catalogue as well as a small one.—Ed.]

Saddlery.

S. W. (*Coleshill*).—Am in communication with a gentleman who can write on Saddlery, both as regards making and repairs. "Smithing and Forging" will be commenced in Vol. V., and in this you will get all necessary information on making and putting on horse shoes.

Cheap Model Boiler.

G. I. B. (*Poplar*) writes :—"Those amateurs who have been asking for a cheap model boiler, will find the appliance figured in the annexed illustration cost about 2s. A, piece of 4 inch rain-water pipe; B, sheet



CHEAP MODEL BOILER.

iron for furnace; C, wires for furnace bars; D, sheet iron for bottom; E, piece of ⅜ inch or ½ inch iron gas barrel, thread at each end; F, piece of brass pipe for funnel or chimney; G, G, G, back nuts to screw on thread of iron barrel; H, H, circular plates of iron, bored in centre for iron barrel, with a groove turned to receive ends of rain-water pipe, filled with tow and red lead; the arrows show direction of smoke. Bore all holes for steam pipes, valve, and gauges before putting together."

Mathematical Instruments.

J. H. W. (*Cleveland, Ohio*).—I am afraid that "an article or two on drafting instruments and how to use them, say in mechanical drawing," although by no means foreign to the nature and purpose of this Magazine, would be deemed a waste of space by the majority of its readers. I think you will find all the information you require in such books as Heather's "Mathematical Instruments: their Construction, Adjustment, Testing, and Use, comprising Drawing, Measuring, Optical, Surveying, and Astronomical Instruments," 5s.; Maxton's "Drawing for Engineers," 4s.; and Pyne's "Drawing for Builders and Students," 7s. 6d.; all published by Messrs. Crosby Lockwood and Co., *Stationers' Hall Court, London, E.C.* If you will take the trouble to write again, explaining your particular requirements, I will endeavour to help you further; and if others, as well as yourself, wish to have the papers you indicate, they shall be given.

Induction Coil.

R. S. (*Birmingham*).—You will have learnt by this time, from the article on "Induction Coils," why yours failed to give satisfaction. You will see that the main faults of your coil were: Secondary too short and too heavily insulated; you used insulating material suitable for a large 12 inch coil. With your short secondary, double the battery power in series might be used with safety. Then, your condenser might be useful as a storage of extra power, but at present it merely absorbs the battery power employed to work the coil. I do not see any possible advantage likely to be obtained by connecting the two small coils together.—G. E.

Map Mounting.

F. S. S. (*Sunderland*).—To mount your maps, get some thin calico and stretch it over a drawing-board, rather larger than the map you wish to mount, or even over a deal table, if you have one of suitable size, which is not in frequent use, for then you would be able to mount two, or perhaps even four of your maps, which you say, are 17½ inches by 14½ inches, at once on the same piece of calico. You can get thin calico at any draper's, but take care to get a good material, with little or no "dress" in it. Turn your map face downwards on a clean surface, damp it with cold water, lightly applied with a sponge or brush, and then spread over it flour paste, of the consistency used by paperhangers. Then take it up and lay it on the calico, dabbing it over lightly with a clean pockethandkerchief, so that the paper may be pressed against the calico backing in every part. When dry, no wrinkles will appear, and with a sharp knife and a flat ruler you can then cut away the map with the required margin from the surrounding calico.

Making Lime.

W. A. D. (*Finsbury Park*).—As you are going to Canada, buy and take with you "Every Man His Own Mechanic," which will tell you how to make mortar, and do many things that you will find helpful. With regard to making lime, the limestone or chalk from which it is made must be subjected to the action of intense heat, and it is therefore burnt in a kiln. I know no other method, and so I cannot give you "a simple and easy method of making lime without apparatus, or with simple self-made apparatus."

Riveting Broken China.

C. G. H. C. wants instructions on this subject. I want a paper on it, too, and so do many other readers. Is there no amateur who is able and willing to write on it?

Bruises in Table Top.

SCREW AND QUILL DRIVER.—The only method of taking bruises out of table top is to scrape it down to the depth requisite to get them out; an occasional bruise can be taken out by constant moistening, just wet it with the tip of the finger every time in passing, in a little time the wood will swell out level again, obviously this would not do for large surfaces.—J. H.

Electrical Music Printing.

J. T. (*Exeter*) writes in reference to CASENHEM'S remarks on this subject in page 357:—"I wish to say how obliged I am for CASENHEM'S offer, and how thankful I shall be for any help, however small, that will help me to accomplish my object." [Permission was given to CASENHEM to help J. T. (*Exeter*) in making an apparatus, but up to this time (July 1st), he has not taken advantage of it.—ED.]

Making Oatmeal.

W. A. D. (*Finsbury Park*).—You put a puzzling question when you ask, "How to extract oatmeal whole from the husk without any apparatus, or how to make a simple apparatus for doing the same." The decortication, or removal of the outer covering of the grain cannot be managed without apparatus of some kind. Pearl barley and Scotch barley are produced by means of machinery, and this is the nearest approach that I know to the extraction of grain whole from the husk. Oatmeal itself, is made in different degrees of coarseness by grinding the grain. The best thing I can advise you to do is to call on Messrs. Kent and Co , or Messrs. Thos. Bradford and Co., whose establishments you will find nearly opposite each other, near the Oxford Street end of Holborn, and inquire if they supply any apparatus suitable for the purpose required.

Sharpening Tools.

SCREW AND QUILL DRIVER.—Your wish has been anticipated by the appearance of the papers, entitled, "How to Make a Treadle Tool - Grinding and Setting Machine," of which, Part 1 will be found at page 361, and Part 2, at page 410 of this volume. Follow Mr. THOROLD'S instructions, and make such an appliance as he describes; you will then have no more trouble about your edge tools. PITCHPINE has given many useful hints about sharpening tools of all kinds in his papers, entitled, "Help for Struggling Amateurs," in this Volume. With regard to saw setting, a little showing from a friendly carpenter will do more to help you than a page of "Amateurs in Council." You ask, "whether the teeth of a saw should always be filed at right angles to the side of a saw, or should the teeth in some cases be filed with a slight bevel on them, and if so, for what purpose?" They should not be filed at right angles to the side of the saw, but on a slight bevel. This is done in order to get a point to the tooth, which will cut sharply against the wood during the downward passage of the saw. The teeth of the saw must first be bent outwards, slightly, by a saw set, and then the file must be applied. The object of this is to make the width between the points of teeth bent in opposite directions greater than the thickness of the saw blade, so that the saw may not drag or hang in the wood when you are using it. You will find some hints on saw sharpening in Mr. Tayler's "Wood Working Machinery for Amateurs," Vol. I., page 501, with diagrams, or Part 2, if you have not got the volume. "A joiner's workbench and lathe combined" would be rather an incongruous affair, for the bench would be in the way of the lathe, and vice versa. The best thing you can do is to buy or make for yourself a good solid bench, and then buy a Eureka Lathe, to be placed on the bench when you wish to do any turning. Holes must be made in the bench for the passage of the cord, and bearings under the bench, to which to attach the flywheel and treadle, which may be a fixture.

E. H.—The above reply to SCREW AND QUILL DRIVER will tell you where to find some hints on saw sharpening.

Lubricator for Lathes, Bicycles, and Sewing Machines.

BOXWOOD writes:—"I notice that G. E. S., in Vol. III., page 386, says, 'I find that a teaspoonful of paraffin added to about 4 ozs. of sperm oil, to prevent its clogging, makes a very good oil for the above purposes.' In reference to this, I have given it a good trial by using it for the bearings of two bicycles, but although it lubricates the machines exceedingly well, I find that the paraffin eats the metal away very quickly, and causes the spindles to shake in the bearings after a short time. I would point out that sperm oil, with just a little black lead in it, is very good as a lubricant, and does not eat the metal of the bearings away."

An Amateur's Work.

R. W. (*Stanley*) writes:—"I have made a violin from instructions given in AMATEUR WORK; also, a fan blast and a fret machine, all of which have given the greatest satisfaction. I have taken the work from the first number, and I would not like to miss a single Part, as they are full of valuable information. I am waiting for instructions on Model Engine Work, which I hope will soon be given." [I am glad to be able to say that Mr. J. Pocock will commence a series of papers on "Model Engine Building," in Vol. V. I trust this will meet the wishes of many readers.—ED.]

Making Tricycle.

R. T. H.—It depends entirely on the skill, patience, and perseverance of an amateur, whether or not he can make a tricycle. You will find all the necessary information and instructions in the papers by Mr. A. Stephenson, entitled, "Velocipedes: Their Construction and Use," in Vols. I., II, and III. of this Magazine. The parts and manufacture of the tricycle are described in Parts 13, 15, 17, and 19, price 6d. each, and to be obtained of the publishers, or through any bookseller.

Window Conservatory.

C. G. H. C.—You ask for instructions on the construction of a Window Conservatory, and say, you have been a subscriber to AMATEUR WORK since its commencement. In that case, you will have read the papers on "Ferneries: How to Make and Manage Them," by Donald Bede. In these, many good examples are given of what I should call "window conservatories." But you may require something different, in which case, I must ask you to describe, as nearly as you can, the kind of structure you require, and specify the size, and state whether it is to be inside or outside the window.

Screw Cutting.

ANXIOUS.—Yes, there is an "arithmetic" method, by fractions. Place number of threads in leading screw over number of threads to be cut, thus:—

$$\frac{\text{Number of threads in leading screw.}}{\text{Number of threads to be cut.}}$$

Suppose leading screw has four threads per inch, and it is required to cut a screw of twelve per inch, then,

$$\frac{4}{12} = \text{Ratio of wheels.}$$

Multiply by some suitable number to bring them within scope of your change wheels say 5 or 10, then we have $\frac{20}{60}$ or $\frac{40}{120}$ *i.e.*, 20 or 40 on the mandrel and 60 or 120 on leading screw. Suppose it is required to cut 24 threads, then,

$$\frac{4}{24} \text{ multiplied by } 5 = \frac{20}{120} \text{ or}$$

$$\frac{40}{120}\ \frac{45}{90} = \frac{40}{120} \times \frac{45}{90} = \text{same thing.}$$

The "Turner's and Fitter's Practical Guide," by Elliott Holden, of *Swindon*, or the "Turner's and Fitter's Handbook," by T. Greenwood, Reliance Iron Works, *Halifax*, will give you full information on this and many other things. The price of the latter is 1s. 6d., post free, from the author, 13, *Church Street*, *Halifax*.—OLLA PODRIDA.

Hints on the Utilisation of Waste Materials.

F. R. T. (*London, W.*).—I am delighted to learn that you and your friends have found material in AMATEUR WORK sufficiently funny to elicit "roars of laughter" from you all, individually and collectively. I have seen gum brushes, of the kind described, in many shops in the streets of London, and I have seen people looking at them, but the gum brushes, or rather gum spreaders, have failed to excite their risible faculties to the extent that they seem to have tickled you and your friends. Mr. R. Lewis—I hope you will not do yourself any serious injury by the paroxysms of laughter into which the information must inevitably throw you—is a practical engineer, who does not spell "generally" with one l, as you do, and as your friends probably do. You ask, "Did R. Lewis invent these things, and does he through (*sic*) them away after using; or has he a heap of them at home? I can picture just such a heap of handy articles." I do not think he makes them to "through" away; his hints, however, have been entirely "throughn" away, it seems, on you and your friends. I think he invented a good many of them, but I am under the impression that "Gardening Illustrated," another "comic journal," of a similar stamp to AMATEUR WORK, was decidedly beforehand with him with the Cat-Teasers, one of the appliances which have made you *larf*. I can assure you that the teasers are no laughing matter to the cats, whatever they may be to you and your congenial friends. You

never planted your slipperless feet on a hedgehog at the bottom of the stairs, I presume; if you did so, and your friends were bringing up the rear, I fancy the bulk of the amusement would fall to their share, and that they would ejaculate, with Mr. Joseph Gargery, "Wot larks!"

Home-Made Fret Saw Machine.

MODEL writes:—"Seeing A. W. W.'s query in the April Part, perhaps I may be allowed to make him a suggestion. I have had no experience with the 'Prize Demas' machine, but if an examination of the woodcuts of them are to be relied upon, they do not seem to be of much use. I once bought a cheap fret-saw machine, but very little experience taught me its worthlessness. I believe the Britannia Co. make a very good Combination machine for £5, or £5 5s.; but would it not be both better and cheaper for A. W. W. to *buy a lathe* and make a fret-saw, or try the fret-saw described in the April Part. After my adventure with the fret machine, I advertised in a popular mechanical Journal, and got a splendid 3-inch back-geared lathe, second-hand of course, with slide-rest, and any amount of tools, chucks, etc., for wood and metal, all that could be desired for wood-work and model making, for less than £5. I am at present making a fret-sawing attachment for my lathe, from my own designs, and if it is a success, I shall be glad to send a description of it to our Journal, if the Editor will give me permission to do so." [Do so, by all means, if your experiment proves a success.—ED.]

Shipman Engines.

S. M. L. (*Goderich, Canada*) writes:—"I am glad to see that the Shipman Engines have been brought to your notice. They are, without doubt, the safest and cheapest goods in the market. They are largely used in the *United States* amongst amateurs and professionals in many callings. The Scovill Manufacturing Company, referred to by F. W. (*Florida*), have branch factories at *Waterburgh, Connecticut; New Haven, Connecticut;* and *New York City*. The latter is the head-quarters of the firm."

Painting on Gelatine.

D. T. S. must varnish his gelatine plates before colouring them; if the colour won't take on the varnish, rubbing the latter with a little finely-powdered pumice stone and his fingers, will probably help matters.—J. P.

Muffles in China Painting.

W. P. (*Withington*).—I cannot recommend, as suitable for amateurs, the muffles of the maker whom you name, inasmuch as they have inherent defects of construction. Moreover, they can only be called portable by courtesy and by comparison, and the fuel they demand is altogether in excess of what is needed to effect the burning in. A very much cheaper, strictly portable, and less objectionable muffle, and quite refractory—although it must be admitted, rather fragile one—is sold by Lechertier, Barbe, and Co., 60, *Regent Street, London, W.* They are sole agents for it in England (it is a French article), and would, I have no doubt, pack it and transmit it to you at the cost of carriage extra. It will be described in the next paper on this subject.—A. DE V.

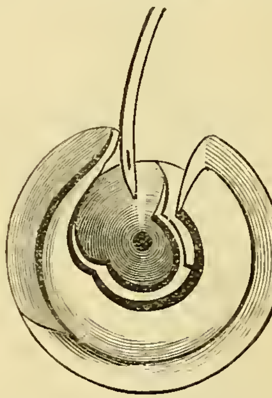
Castings at Cheap Rates.

G. E. G. (*Brixton*) writes:—"I have received so many hints from this Magazine as to what to buy and where to buy it, I should like to call attention to the following, which I am sure, will be useful to many of our readers: The fearfully high prices asked by founders for casting small work, sent me hunting around for some one fairly reasonable, and I at length dropped across Mr. W. Gardner, *Wyvil Street, Wyvil Road, South Lambeth Road, S.W.*, and I think his charges will occasion delight to many amateur machinists, viz., 9d. per lb. for brass, fair-sized articles, and 10d. for very small; 10d. per lb. for middling gun metal castings, and 11d. for small. I had fifty pieces cast, weighing only 2 lbs. together, for 1s. 10d. I think these, compared with Bateman's prices, would lose him a few customers."

INFORMATION SUPPLIED.

Repairing Sewing Machine.

S. G. G. (*Bath*) writes to D. S. NETTO (*Aden*).—"To make the rotating hook, take the top cotton; you must first of all see the



CAM OF SEWING MACHINE.

needle is set right. This class of Wheeler and Wilson's machines uses the bent needle, which should project at top of needle yoke, the part that it goes through to be fastened about a quarter of an inch, then see that the needle goes straight through hole in plate, if it does not bend it a little in the required direction. Now turn the cam underneath to revolve the hook, which is the part that catches the loop formed by top cotton, and when the needle is rising up, loosen the screws, which you will find in cam, and turn the hook round, so that when the eye of the needle is opposite the inner segment of hook the point of hook is just level with the needle, as sketch, when make screws firm to secure hook in position. You will want a new brush, as the machine will not work without. This brush should just touch the hook, so as to hold the cotton till the succeeding loop is caught by the hook. Should you be unable to get brush, I can supply you; the editor has my address."

Re-Tinning Stewpans.

Loco (*Sohagpur*) writing in reply to J. C., says:—In this country (India) all pans are tinned, the generality of them being copper, and a few brass. This is how it is done: Procure sal ammoniac, say 1 lb., put it in a saucepan and boil with water until all water is evaporated, this clarifies the sal ammoniac. Then grind with mortar to a fine powder. Now clean your copper or brass utensils of all grease and dirt, with either salts or earth. Then hold the utensil over a steady fire, with a blast, if convenient, until it is hot enough to melt a stick of pure tin held against it. Then throw in some of the powdered sal ammoniac, and rub the stick of tin on it a little. Take a piece of soft cloth made into a ball, or old ticking, and whilst the pan is smoking and hot, apply the cloth to the pan, and rub the tin and sal ammoniac over the utensil; if it gets cool, warm again until you have the surface well covered with tin. When completed, wash in cold water to take the sal ammoniac off. When copper utensils are in constant use, they require tinning at least once a month, but must be cleaned daily after use. I have found, from experience, that food from new tinned utensils has a costive effect on me, but precisely the opposite effect if allowed to go too long without tinning. With a little practice J. C. will be able to tin any article, however large, perfectly smooth.

Le Page's Liquid Glue.

J. F. (*Brixton*) writes:—"If you have room for a testimonial in favour of Le Page's Liquid Glue, I would say from experience of two years' use, it is one of the most useful and ready compounds ever placed before the public, entirely superseding the old glue pot with its waste of time, delay, fuss, and so on. The former is always to hand in a moment, clean, economical to a degree, and effective to almost whatsoever applied, be it paper, china, or wood."

Cement for Fixing Lamps.

F. S. writes to inform J. B. C. "that he may fix glass in metal sockets by a paste made of powdered whiting and very weak glue."

J. F. (*Brixton*) writes in reply to J. B. C. (*Wotton-under-Edge*):—"You should mix a small quantity of glue, gum, or Le Page's liquid glue, with plaster of Paris, instead of water, and you will find this hold tight. Plaster and water will not last, as I have proved, it is only a question of time before the paraffin eats it away. I would also add, always keep these parts clean, and wipe away the oil as it accumulates thereon, it has much to do with keeping matters intact."

Renovation of Leather.

A. F. S. O. writes in answer to W. T. B.—"It is not possible to restore the colour of worn leather. This is from an upholsterer, a friend of mine."

Highly-Malden Lantern.

J. F. Q. writes:—"I note that J. N. (*Kilburn*) is inquiring about this lantern in 'Amateurs in Council.' Mr. Samuel Highly is still living, and his present address is 22, *Charlotte Street, Bedford Square, W.*" [I am obliged to J. F. Q., and am glad to hear that Mr. Highly is yet on this side of the

curtain that separates the visible from the invisible. Many years have elapsed since I last had the pleasure of dealing with any of his "copy."—Ed.]

Painting Dog-Cart.

W. P. W. writes in reply to Truly Rural:—"It would be useless for you to attempt to paint your dog-cart unless you have painted carts or dabbled in house painting, as coach painting is considerably above house painting, for everything has to be finished off so carefully, and to be like polished glass when finished off; but I see no reason why you should not be able to paint your dog-cart, and then get a coach painter to fine line the carriage work for you, a very common practice, either in town or country, as a liner does this at nights if he is in a regular shop. They are employed mostly by those who cannot afford to keep a regular painter, and then the employer does the painting himself. You want the body black, this is quite right, but about the light blue I do not understand. I have painted many a cart, but none this colour. What we term a light blue, is to mix white with blue, it is only fit for lining and painting heavy carts; the blue you want is ultramarine, the best—this is a beautiful rich blue, but black lines would be too dark. A more suitable colour would be vermilion, or straw colour, but you do not say if the paint on the panels is cracked or blistered. It should have two coats of varnish, the reason of the varnish having a slightly greenish cast, is, that after each coat of paint, and before varnishing, the work has to go through a special process. Coach painters, as a rule, keep everything a secret, but I do not think this fair, as they could not lose anything by it."

"Catch 'em Alive."

Boxwood writes:—"In Vol. IV., p. 47, H. M. H. asks for a receipt to make the sticky substance spread on fly papers, which is sold under the above name. If he boils a little linseed oil until it becomes thick enough, it will be very sticky, and if spread on paper or twigs of green stuff, the flies will stick to it abundantly. The papers or twigs should be hung up by a piece of cotton in the centre of the room, or near the window. This answer is late in being sent, but as I think no one has yet answered his query, he may think it better late than never, as the fly season is on us again."

Design for Flute.

Ebonite writing in reply to Flute's question in page 407, agrees with the Editor's remark, and thinks that there are not six amateurs in London who could make a complete Boehm Cylindrical Flute at the first attempt, satisfactorily, even if they had the necessary appliances; still, if Flute is enthusiastic, he should get "Boehm on the Flute," published by Rudal Carte and Co., 23, *Berners Street*, price 2s. 6d., and study it very carefully. Any information that it does not give, I will supply. But it is too much to expect a set of elaborate drawings without there are a number of readers interested.

Handles for Table Knives.

A. F. S. O. writes in answer to Neptune—"Nearly all cutlers supply bone and ivory handles for knives. You can get them at I. and C. Tidmarsh, 4, *Castle Street, Holborn*. The cement usually used is resin with a little brickdust or fine sand. Fill the hole in the handle with the cement, *powdered*, then make the tang of the blade hot, and thrust it in the hole, leave it till cold, then you can clear off the cement that has run outside. Be quite sure you put the tang in straight."

F. S. writes in reply to Neptune:—"Knives may be fixed in handles with cutler's cement, made by melting beeswax and resin together, and mixing with this compound an equal quantity of powdered brickdust (bath-brick). Fill the hole in the handle with this composition whilst warm, and warm the 'tang' before pushing it into the handle."

Repairing Minnow Net.

Delta writes in reply to Punch:—"I don't see how a new bottom could be put in the net referred to, the only plan is to continue netting, and narrow to a point as it was at first. The best landing nets are made with a *square* bottom, and netted round and round until the proper depth is attained. If Punch wishes to make one the same width and mesh as the old one, with 137 stitches when cut off, let him commence by netting 34 stitches, and continue his work until he has 34 on each side, then go round and round, holding the square by centre, and taking care about the corners, which are rather awkward for a few rows. I think if Punch be 'up to the ropes' in netting, he will be pleased with the result."

Thompson's Silicate Oxide Paint.

G. E. G. (*Brixton*) writes:—"I can strongly recommend to the readers of this Magazine, H. Thompson and Co.'s Magnetic Silicate Oxide Paint, at 3s., 7 lbs.; 6s., 14 lbs.; and 11s., 28 lbs.; to be obtained of the manufacturers, at 95, *Merrow Street, Walworth Road, S.E.* I find this excellent for iron, and all metals, and outdoor woodwork, though I use it for everything except fancy work. They make an iron rust colour as a first coat, and the way it lays on and keeps there is grand; also, a variety of colours for top coats. They are very obliging, and sent me price list at once on application."

Mending Mackintosh.

S. G. G. (*Bath*) writes in reply to K. A. T.—"Get a small bottle of india-rubber cement, as used by shoemakers in putting on patches, price 2d. Then get a piece of twill lining, and cut same to overlap torn part. Give the lining and the edges of torn part two or three coats of solution, letting each dry, then hold to fire, not too near, till it becomes sticky, when bring torn edges together and press down lining on top, when you will find a neat and perfectly waterproof join.

A. F. S. O. writes in answer to K. A. T.—"Take a small piece of very thin linen, the colour your mackintosh is inside, buy a small quantity of india-rubber solution, which is from 2s. 6d. to 3s. per lb.—2 ozs. would be enough, I should think. Take a small quantity of the solution on your finger, and rub each side of the tear in your coat, and on one side of the linen, set it on one side for *one hour*, then take the linen, put the edges close together and lay it on the cemented edges, it will be ready for use in about three hours. You must be very careful in putting the linen on the cemented edges, because if you move it you will tear it all up. The india-rubber solution can be bought of the North British Rubber Co., 57, *Moorgate Street*."

F. S. writes:—"To mend the torn mackintosh, K. A. T. should get some dissolved india-rubber, and with it smear a slip of cambric to lay over the torn edges nicely adjusted."

INFORMATION SOUGHT.

Soap Making.

H. D. D. writes:—"I have made some soap from the receipt given in Amateur Work some time ago; but it has a strong smell of lime. Perhaps some reader can tell me how to obviate this."

Drill for Stone.

A. B. (*East Grinstead*) asks:—What is the best kind of drill to drill holes in Portland stone, from one to two inches deep, in which to cement iron stubs to tie wire trellis to for climbing plants to cover front of house, its price, and where to get it? A steel one made by a local smith proved ineffective.

Shooting Block for Picture-Frame Making.

Perfect writes:—"A friend tells me he has a shooting block for picture-frame making which shoots both mitres, and he uses the plane with his right hand to shoot both mitres of the moulding. I have one, but I have to use plane with left hand to shoot second mitre, unless I turn moulding on its face to plane the second; this is not so well, as it does not make such a good mitre. Will one of your readers kindly inform me the way a shooting block is made to shoot both mitres, and use the plane with the right hand, without turning moulding on its face to shoot second mitre, as my friend refuses to show me his block?" [Scarcely a friend!—Ed.]

Decorative Birds.

W. C. H. writes:—"Is there any one who can tell me if any cheap work is published that treats of 'Decorative Birds and Flowers?' if so, would he kindly mention the name and price, and where to get it?" [I do not know, myself, of any book of the kind, and I fear your query will not elicit any response; but if you will write again and say to what the decoration is to be applied, and the birds and flowers which it is desired to use, I will send your letter to a gentleman who is competent to advise you as to the execution of the work.—Ed.]

Fern-case.

A. M. G. writes:—"Will any brother reader kindly favour me with a sketch of a nice fern-case about two feet long (a little open fretwork preferred) to be made with wood? As I have only been a subscriber for a few months, please not to refer me to back numbers." [I abstain from referring you to back numbers, as you request, but I can assure you you would benefit by reading Donald Bede's papers, entitled, "Ferneries: How to Make and Manage them," in Vols. II. and III.—Ed.]

Oatmeal in Soap Making.

IONA asks:—Can any amateur, who has tried soap making, tell me if oatmeal has been tried to increase its lathering properties, and if so, with what result?

Boiler for Small Engine.

J. H. (*Whitchurch*).—Can any reader of AMATEUR WORK inform me what size boiler I should require for half-horse power engine; also, what material would be best for making it?

NAME WANTED.

*** A Correspondent writing from *Argyllshire* gives his address but appends no signature to his letter, in which he states he has sent money for a certain article, but has not received the article in return for cash, and asks me to look into the matter. A letter has been written to the person named in his letter, asking him to explain his apparent neglect, but as, for obvious reasons, the reply, if it is vouchsafed, must be sent to my unknown correspondent by post, I must ask him to send me his name.

SALE, PURCHASE, OR EXCHANGE.

Persons availing themselves of this Department of AMATEUR WORK *are requested to note that—*

(1) *No Trade Advertisements can be inserted in this Department, which is open to bonâ fide Amateurs only. The Editor reserves the right of refusing to insert any notice.*

(2) *No charge will be made for the insertion of notices until their number be such as to render it absolutely necessary to do so.*

(3) *Persons writing in reply must forward application under cover to the Editor, in an envelope sealed down, with a Penny Stamp attached in the upper right hand corner, and the* NUMBER *of the notice in the lower left hand corner thus:—*

	STAMP here.
NO. OF NOTICE here.	

(4) *Letters thus marked and enclosed under cover to the Editor will be forwarded immediately to owners of articles for Sale or Exchange, or persons wishing to purchase. No attention will be paid to any communications in which these Rules are not strictly observed.*

(5) *It is desirable that those who reply to notices in this Department should enclose to the advertiser, with their application, a stamped and directed envelope, in order to ensure a reply. When this precaution is not taken, the non-receipt of a reply within reasonable time can only intimate that the article in question is disposed of, or that the proposal made is declined.*

567. **Small Siemens' H Armature** for sale, ready for winding, 3¾ in. long and 1⅞ in. in diameter. Price 1s. 6d. (*Manchester.*)

568. **Brass Model Engine and Boiler,** would suit a model steam boat; in splendid working order. Free for 3s. 6d. (*Manchester.*)

569. **Boxing Gloves.**—Set of Four wanted. Must be all hair, in good condition, cheap, and on approval. (*Sunderland.*)

570. **Air Pistol,** Nickel Plated, and in good condition. Will shoot darts or slugs. 10s. cash, or exchange for Tennis Racquet, about 14 oz., or for Fretwork Machine. (*Westmoreland.*)

571. **Two Copying Multographs,** 13 in. by 9 in., and 9 in. by 6 in., with ink, 5s. and 3s. each, or what offers in Electrical Apparatus or Fretwork? (*Burnley.*)

572. **Cornice and Pillars.**—Shop Cornice, several yards, and Turned Wood Pillars, pine, polished. 32 are 17½ in. long, 11 are 13¾ in. long, and 13 are 12 in. long. What offers in exchange? (*Burnley.*)

573. **Large Cedar Wood Tool Chest.**—What offers in exchange? (*Burnley.*)

574. **Medical Work.**—Wanted, Graham Brown's Diagnosis of Diseases, Second Edition. (*Pickering.*)

575. **Art Journal for 1882.**—Eight Parts at 2s. 6d. each, good as new, offered in exchange for AMATEUR WORK, Parts 1 to 37. (*Bristol.*)

576. **Pair of Voicing Bellows,** 31 in. by 20 in. Single feeder and pair of ribs, movable valve boards, safety valve, leather valves, hinges, and gussets, other joints of prepared calico. Holes with plugs to fit large or small pipe feet. Invaluable for voicing large pipes. Price 4s. 6d., purchaser to pay carriage. (*London, N.*)

577. **Amateur Work.** — Complete copy, Nos. 1—42, with Supplements, unbound, clean, and in perfect condition. Will take 10s. for same. (*Cricklewood.*)

578. **Lathe,** with 3 feet Bed, Screw cutting, with usual change wheels and spanners. Cost £17. Nearly new. Larger lathe wanted, or what offers? (*Newport, Mon.*)

579. **Concertina.**—One of Wallis' Patent Anglo Concertinas, 20 keyed, steel notes, good tone. Cost £2 2s., will sell for 25s., or take in part exchange Vols. I., II., III. of AMATEUR WORK. (*Darlington.*)

580. **Popular Educator.** — First Six 2s. Parts, Subscriber's issue. What offers? (*Darlington.*)

581. **Books, Various.** — (1) Magnetism and Electricity, by F. Guthrie, 2s., quite new, cost 3s. 6d.; (2) Every Man His Own Mechanic, Parts 1 to 4, 1s.; (3) Colenso's Algebra and Arithmetic, 1s. each; (4) Mensuration, 6d.; (5) The Mountain Patriots, 1s.; (6) The Children of Cloverly, 1s.; (7) Life of O'Connell, 1s.; (8) Sullivan's Dictionary of Derivations, 6d.; (9) Bacon: His Writings and Philosophy, Vol. I., 1s.; (10) Magnetism and Electricity (Blackie), Part 3, 4d. (*Galway.*)

582. **Schooner Yacht.**—Hull, 3 ft.; beam, 9 in. Newly rigged and painted. Was built as a racer. Price £2 10s. (*Battersea.*)

583. **Horizontal Bar,** 6 ft. long, square ends, with posts ready for fixing in the ground. 8s. (*London, E.*)

584. **Cricket Bat,** only used twice, 5s., cane spliced; or offers. (*London, E.*)

585. **Register Stove,** suitable for Greenhouse or Workshop. 10s., or offers. (*London, E.*)

586. **Photographic Rolling Press,** cost 20s., and Head Rest, cost 25s. Exchange for Lathe Chucks, or good founts of Printer's Type, or cash offers. (*Cornwall.*)

587. **Printing Appliances.**—Two Printing Presses, suitable for amateurs, both new, one to print 10 by 8 in., the other 8 by 6 in., with three founts of Type. Also one Type Case, 6 in. Roller, and 3 Iron Chases. Price £2, or exchange for Model Engine, ½ or 1 horse power, or anything useful. (*Durham.*)

588. **Telegraphist, Wanted,** Vol. I., bound or unbound. Will give cash. (*Lewes.*)

589. **Fifty-two in. "Special Challenge"** Bicycle, in good order, with roller bearings, and all tools, etc. Full particulars on application. Cost £12 12s., nearly new, will take £4, or exchange for strong light lathe and tools; also back parts of AMATEUR WORK wanted, or other goods to value of £5. (*Grantham.*)

590. **Electrical Appliances.**—A Sprague's Universal Galvanometer; a powerful Medical Coil; a ½ inch Spark Coil, and Batteries for same; a large Electric Bell, and quantity of Wire offered at half price, or exchange for Lantern Apparatus. (*Manchester.*)

591. **Iron Half-long,** warranted in first-rate working order, length 15¼ in., 2⅜ in. iron, new. Cost 22s., will sell for 11s. Carriage paid. (*Wick, N.B.*)

592. **Boy's Own Paper.** — Vols. I., II., IV., and V., and one case for binding, clean. Will sell the lot for 8s. (*Dublin.*)

593. **Four-inch Slide Rest,** with Compound Tool Holder. Never been used. Price £3. (*Dublin.*)

594. **Books, Various.**—(1) Maxwell's Life of Duke of Wellington, original edition, published at £3 7s. 6d.; covers worn, but complete, will take 5s. lot, or offers in exchange; (2) Boy's Own Paper, unbound, Vols. IV., V., and VI., complete, with plates and indices; 2s. 6d. per vol.; (3) Cassell's Natural History, first 32 Parts, except Part 24, last edition, 5s. lot. Purchaser pays carriage. (*London, E.*)

595. **Pin-Fire Breechloading Gun,** 16 bore, double barrelled. Has seldom been used, but is in perfect condition. Beautifully engraved, Lefanchen's make. Cost over £12, will take £7 cash, or exchange to value in approved goods. Approval on the deposit system. (*Hull.*)

596. **Lathe,** turns 12½ in. by 6½ in., 30 in. iron gap bed, back-geared, heavy 17½ in. iron flywheel, adjustable bearings, 4 chucks, 2 carriers, 4 tools (wood and metal), wrenches, grindstone, callipers. Solid oak frame with drawer. Price £2. (*London, N.*)

597. **Prize Holly Fret Saw,** very little used, and in first-class condition. Price 7s. 6d. (*London, N.*)

598. **Organ Materials.** — Pair Voicing Bellows, single fold, one feeder, movable valve boards, escape valve. Size, 20 in. by 31 in. Price 4s. 6d. Also, roll of special paper for pipes, 4½ ft. wide, 30 yards long. 2s. per 12 yards, or offers. Also, a skin of prepared sheepskin, stout and soft, with some scraps. Carriage paid, 1s. 9d. (*London, N.*)

599. **Books, Various.** — (1) Ward and Lock's Universal Instructor, 3 vols., newly bound in half-roan, perfect condition; (2) Technical Journal, Vol. I., unbound; (3) Lardner's Popular Astronomy; (4) Practical Keramics for Students, by C. A. Janvier. What offers in cash or exchange? (*Hull.*)

600. **Stephen's Book of the Farm** Wanted. Last edition, in good condition. (*Hull.*)

601. **Fret Saw and Lathe.**—Lester Improved Fret Saw with Lathe Attachment, Circular Saw Attachment, and iron table and drilling spindle. Price 26s. (*Edinburgh.*)

602. **Platinum Crucible,** weight, 1 ounce 2 drams, with lid. Will sell for 27s., or exchange for AMATEUR WORK, Parts 1—37 inclusive, clean and with plates, unbound, and 5s. in cash. (*Sherborne.*)

603. **Chemical Apparatus and Chemicals.**—About 40 chemicals in bottles and 30 pieces of apparatus. Price 25s., cash. (*Leeds.*)

604. **Photographic Apparatus,** including ½-plate Camera and Lens, Bath, Plate Box, Printing Frame, Porcelain Dishes, etc. 30s. cash. (*Leeds.*)

605. **Engine Boiler, etc.**—Wanted to purchase, for cash, a Boiler suitable for half-horse power Engine, also a flywheel for ditto. (*Whitchurch.*)

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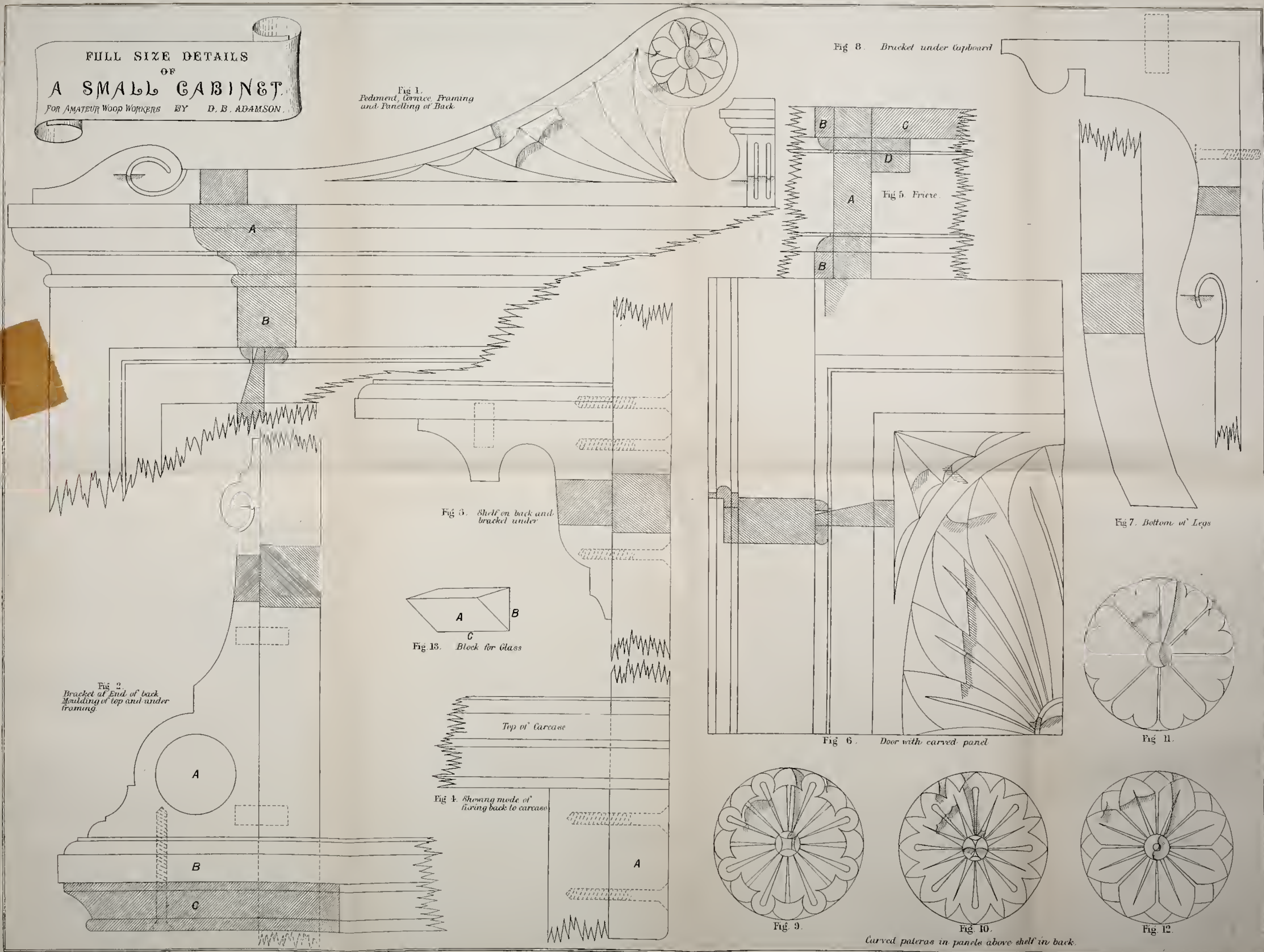
A. F. S. (*Dresden*)—Reply to your query delayed by illustration necessary to explain it; E. H.; R. H. (*Limerick*); C. H. O. (*Cairo*); J. W.; C. J. D.; Mr. GLEESON-WHITE; S. M. L. (*Goderich, Canada*); X. Y. Z.; C. J. (*Nottingham*); E. A. M. (*Sheffield*); BLIKNEUS (*Cape of Good Hope*).

*** List closed July 1st.



WARD, LOCK, AND CO., WARWICK HOUSE, SALISBURY SQUARE, LONDON, E.C.

CUTTING AND POLISHING PEBBLES.

By LAP.

OFTEN in walking on the seashore our attention has been attracted by some beautiful pebble or stone, all glistening and showing its brilliant colours in the sunshine, and picking it up, we have carefully stored it away, intending to save it as a treasure. But how very disappointed we have been when we next examined it to admire, for we find that all its beauties have fled, and that it is only a "common stone" after all. Its special beauty and colour were brought out by its being wet, and now that it is dry, the roughness, caused by its ceaseless rolling by the waters, perhaps for centuries, makes its surface (so beautiful when wet) to appear dull, and of an almost uniform grey colour. But by proper smoothing and polishing, all the beautiful colours and markings which showed so well when wet, can be made to re-appear, and can even be considerably increased.

It is in order to show how stones can be polished and made "beautiful for ever" by amateurs, that this article is written. Simply polishing the outside of a stone, very often makes it a beautiful object, but when ground to a flat surface, or, better still, cut into thin slices and polished, its beauty is increased tenfold.

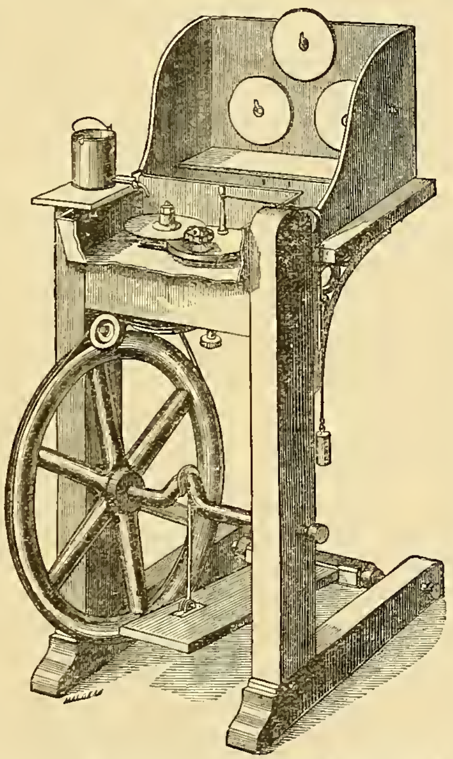


FIG. 1.—SELF-ACTING APPARATUS FOR SLITTING AND POLISHING ROCKS, PEBBLES, FOSSILS, ETC. PERSPECTIVE VIEW.

In all ages, and by all people, beautiful stones have been highly valued. From the diamond, the Queen of gems, down to the common agates, stones have been the subjects on which, from the earliest times, immense labour has been expended to increase their beauty, and prepare them for ornaments. The term *gems* is applied to precious stones, which, from their colour, lustre, brilliant polish, rarity, and other qualities, are sought after as objects of dress and decoration. To the most select class, the title *gems*, or *jewels*, has been given, while the term, *precious stones*, is more generally applied to those valuable minerals which are found of larger size and in greater quantities than gems. Diamonds, sapphires, emeralds, rubies, topazes, opals, hyacinths and chrysoberyls, are considered the most valuable *gems;* while the more numerous and inferior class of *precious stones* includes: crystalline quartz, amethyst, lapis-lazuli, malachite, jasper, agate, etc.

Cutting, polishing, and engraving gems and precious stones is the art of the lapidary, and this art we will now proceed to consider in its practical working. The diamond, which is the hardest substance known, can only be cut by diamond. Louis de Berghen, in 1476, discovered that two diamonds could be polished by rubbing them together, and from that time, all the finest diamonds went to Holland to be cut and polished, and Dutch artists, for a long time, had the reputation of being the best of lapidaries. Probably the stones chiefly operated upon by amateurs will be agates, madrepores, etc. The term agate is not employed to denote any distinct mineral of uniform composition, but is applied rather to certain mixtures of siliceous minerals, consisting of different varieties of chalcedony, usually associated with jasper, quartz, amethyst, and other natural forms of silica. We may here give a short description of how agate polishing is carried out on a large scale, as this will enlighten us as to the principles involved in the work, and make the practical instructions for amateurs more clearly understood.

The principal seat of the industry of cutting and polishing agates is a small district of Western Germany. Oberstein and Idar are the chief centres of the agate trade. From the low rate of wages in this district, agates are cut and polished at incredibly low prices. The bulk of the polished pebbles sold at the English watering-places are American agates, cut and polished in Germany. The operation is as follows:—The agates are first roughly dressed with a chisel and hammer. An experienced workman can tell at a glance how an agate will best split, and with a few well directed blows, can trim it roughly into the shape it is intended to assume. More valuable stones are,

however, sawn into shape. The grinding is effected on large grindstones revolving on a horizontal axis, and driven by a water wheel. The grindstones are of new red sandstone; they are about five feet in diameter, and one foot in width on the face, and they are driven so that the grinding face moves at a speed of about 50 feet per minute. They are kept constantly wet by a small stream of water running over them. The workman lies in an almost horizontal position, having a block of wood to rest his body upon, and another block is fixed to the floor for him to press his feet against, which enables him to press the agate to be ground, with great force against the grindstone. The agate is either held directly in the hand, or is fixed to a short piece of wood for more conveniently applying to the grindstone. The special form desired is given to the agate by holding it in certain grooves cut in the grindstone. The friction while grinding, causes the agate to glow with a beautiful phosphorescent light, visible even in the daytime, and quite distinct from sparks. After having been ground to the shape required, the agates are polished with tripoli, on a cylinder of hard wood, or on a plate of tin or lead. An important branch of this trade is the artificial staining, or colouring, of the agates. Some particulars of this will be given after we have concluded with the cutting and polishing process.

In applying to practice the knowledge we have obtained so far, of the lapidary's art, we will commence by describing the method of performing the simplest operation in the simplest manner—viz., to smooth and polish a pebble with the least possible outlay for tools or apparatus. As Mrs. Glasse says in her cookery book, describing how to cook a hare, "First catch your hare," in other words, first select your pebble. In order to save labour, it is advisable, as a first trial, to select one not too large, but as smooth and as free from flaws and indentations as possible. If it is large enough to hold firmly in the hand, it can be manipulated without mounting in any holder, but if a small stone is going to be worked, it is more convenient to fix it at the end of a piece of wood, which makes it much better to handle. It must be fixed to the handle by means of cement, and a very good cement for the purpose is a mixture of Burgundy pitch, resin, and beeswax. The exact proportions are not particular, but vary according to the temperature of the weather. In cold weather more pitch and beeswax are used, and in hot weather more resin; but the proper proportions of each will be found without any trouble in practice. Some persons add a little plaster of Paris, but this is usually unnecessary. A cement called lapidary's cement is prepared specially for this purpose, and can be obtained (as can all the other articles and apparatus used by lapidaries, which we shall describe) from the Leicester Utility Company, 10, *Yeoman Lane, Leicester*, by those amateurs who do not wish to make the cement for themselves. To fix the stone, soften by means of heat a small lump of cement, and apply to the end of the wooden handle which has been previously warmed; then warm the stone, and while the cement is still soft, embed the stone in it, leaving exposed that portion which is to be ground and polished.

If the whole surface of the stone is to be polished, it can easily be removed from the cement as each portion is ground down, and after replacing in a different position a fresh portion can be ground, repeating this operation till the whole surface has been operated upon. Fig. 2 shows a stone thus mounted, A being the wooden handle, B the cement, and C the stone. Having thus fixed or mounted the stone we are ready to commence, and not being possessed of proper lapidary's apparatus we must make use of a common grindstone. If we cannot get access to a grindstone we can make shift with a slab of sandstone, but this means more labour. The writer has forwarded to the Editor a small piece of madrepore which was ground on the *kitchen sink*.* But we will suppose in the present case a grindstone is used. We must get some one to turn the grindstone for us, as all our attention will be required by the stone we are going to polish. By means of the wooden handle (to which the stone is fixed) we shall find it very easy to hold the stone to the surface of the revolving grindstone (which must be kept wet) and to keep moving it about till a somewhat even surface is produced. By examining the wet surface of the stone as we proceed with the grinding, we can see the colours and markings, and if the whole surface of the pebble is not required to be polished, we can select that portion which pleases us best for finishing. Having decided what portion we will polish, that portion must be further ground till perfectly even and of the shape required. If the stone is now dried it will be seen that the surface we have been grinding is covered with rough scratches. These must be removed by further rubbing, this time on a piece of "water of Ayr" stone with plenty of water. If the surface to be polished is flat, of course, a flat piece of stone must be used to rub it on; if a convex surface is desired, a groove of the proper form in the "water of Ayr" stone will make the operation easy. This rubbing must be continued until on drying the stone no scratches can be perceived, but a uniform "dead" smooth surface has been obtained. For small convex surfaces we find the following a very good method. Get a small piece of hard wood about

* This specimen was very well ground and had a fair polish on one of its plain surfaces.—ED.

5 inches long and a $\frac{1}{4}$ of an inch thick, similar to an ordinary lead pencil, and drive it tightly into a common bobbin or reel on which cotton is wound, leaving the wood projecting $1\frac{1}{2}$ inch at each end of the reel. One end of this wood must be cut to a blunt point, and to the other end the stone must be cemented. Another small block of wood with a small hollow, will make a socket for the sharp end of the above to work in (see Fig. 3). A, the hard wood spindle; B, the reel; C, the stone cemented at end of spindle; D, socket for sharp end of spindle. This can now be used in exactly the same manner as a "fiddle drill," the stone to be ground taking the place of the drill, and being made to revolve backwards and forwards by means of a bow and string passed round the reel, at the same time pressing the stone by means of the socket D, into a hollow of the proper shape formed in a piece of sandstone, E, using plenty of water, and finishing with a piece of water of Ayr stone, having a similar hollow, to remove the scratches as before explained. Having thus removed all scratches and obtained a perfectly smooth surface, the polishing proper can be proceeded with. A piece of board about 18 inches long, 6 inches wide, and an inch thick, is covered with felt on one side. The felt should be stretched tightly and tacked to the *ends* of the board. It is advisable not to put the nails or tacks through the felt into the top surface of the board, as there would be the danger of the polished surface of the stone coming in contact with them, and getting injured thereby. The surface of the felt should be slightly oiled and dusted over with fine emery flour. The stone must then be rubbed backwards and forwards until the surface begins to appear as if it really would polish. When it seems as if continuing the rubbing produces no further effect, the final polish is produced by rubbing on another felt-covered board dusted over with putty powder. Putty powder is the binoxide of tin, and puts a most brilliant glass-like polish on the surface of the stone. It is necessary to be very careful that the putty powder is free from the least particle of grit, otherwise, when the polishing ought to be complete and perfect, it may be found that the surface is marred by a few ugly scratches, which greatly detract from the beauty of the finished article; and to get rid of these scratches would necessitate going through the whole operation with the emery and putty powder again. Tripoli powder, with water spread over the smooth surface of a piece of hard wood without felt, will be found the best for finishing some stones. I have now given all the instructions necessary for simply polishing a pebble, and I am sure that anyone carrying them out will feel amply rewarded for the labour they have expended; in fact, many will now not be satisfied with polishing only, but will want to *cut* as well. For this purpose, however, it will be necessary to use some special apparatus, the best form of which we will now describe. Reference to the drawings will enable anyone thoroughly to understand the whole process of slitting, cutting, grinding, and polishing rocks, pebbles, fossils, etc. This apparatus is especially useful for cutting thin sections of rock, etc., for microscopical examination. It consists, as seen in Fig. 1, of a mahogany framework, similar to that of an ordinary lathe, and is supplied with crank, flywheel, and treadle, occupying a floor space of 2 feet 2 inches by 20 inches. The bed of this frame is fitted with an iron casting bored to receive two spindles,—viz., A vertical spindle which carries the slitting disc, grinding laps, etc., and another spindle to which is fixed a horizontal plate carrying on its surface a cup containing cement, into which the material to be cut is embedded, and which is retained and uniformly pressed against the slitting disc by means of a cord attached to the plate, which passing over a pulley having a suspended weight, gives a constant and regular pressure to the plate carrying the specimen.

There is also a convenient arrangement by means of a screw for raising or lowering this plate to any nicety, for the purpose of regulating the thickness of the slice required. The slitting disc and laps are made to revolve at the rate of about 500 revolutions per minute, by means of a treadle used in the ordinary way. By means of a zinc tray, provision is made for catching all the water and grinding material which may fly off from the discs, so that it may be used without inconvenience even in a library or drawing-room. The whole forms a very convenient and complete arrangement of a lapidary bench for the amateur. For convenience of packing and forwarding into the country, it can be taken to pieces and put together in a short space of time, each corresponding part being numbered. As will be seen from the drawings, the machine consists of a wooden framework, *a*, *a* (see Figs. 4 and 5), supporting a crank axle and driving wheel, two feet in diameter; the top part of this frame consists of two cross-pieces, *a'*, *a'*, fixed about an inch apart, as in the bed of an ordinary turning lathe; into the slot between them is placed a casting, B, carrying the bracket for the angle-pulleys, C; this casting is bored to receive the spindle, D, which, by means of the treadle, is made to revolve at the rate of 400 or 500 revolutions per minute. It is also bored to receive another spindle, E, to the top of which is fixed a metal plate, F, for carrying the small cup, H, to which the specimen is attached by means of cement. This means of mechanically applying the work to the slicer is far preferable to holding it in

the hand in the ordinary way; the requisite pressure against the cutting disc is regulated by the weight, G, and the thickness of the slice by the thumb screw, K, on which the spindle, E, rests. By this means, it is possible to cut tolerably thin and parallel slices, the thinness, of course, varying according to the strength of the rock which is being operated upon. The slitting disc is made of soft iron, 8 inches in diameter, see Fig. 10, and about $\frac{1}{5}$ of an inch in thickness, and is fixed on the spindle, D, between two brass plates in the ordinary way. In cutting hard stones the edge of the slitting disc is charged with diamond powder. The operation of charging the edge of the disc with diamond powder requires some little care. Having reduced the diamond to the requisite degree of fineness in a hardened steel mortar (so fine that no sparkling is perceptible on exposure to light), a few grains are placed in a watch-glass, made into paste with a drop of sweet oil, and applied to the edge of the disc with a quill; while the disc is being slowly revolved by hand, it must be gently pressed in with a small roller of glass or hard steel, Fig. 6, until the particles of diamond powder are securely bedded in the edge of the metal, care being taken to avoid getting any of it on the sides of the slicer. In cutting, it is better to steady the work with the hand, and not to trust for pressure entirely to the suspended weight. The work must be constantly lubricated with oil of brick; spirits of turpentine will, however, answer the purpose.

I append drawings of the mortar necessary for crushing the diamond, Figs. 7 and 8, also of the glass roller used for applying the diamond dust to the edge of the slitting disc, Fig. 6. Having cut the slices, they can now be polished. The slitting disc must be removed from the spindle, D, and replaced by a lap. The "lap" is a plate of metal, about 8 inches in diameter, and about $\frac{3}{8}$ of an inch thick in the centre (see Fig. 9). It is cast with rounded edges, and slightly convex sides, as this form facilitates grinding to a level surface, there always being a tendency on a flat surface (which soon wears hollow) for the edges of the stone to be ground away quicker than the centre. The laps are made of lead or other metal,

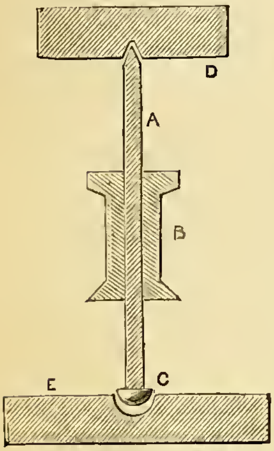


FIG. 3.—ARRANGEMENT FOR GRINDING STONE.


FIG. 9.—LEAD LAP. (8 inches in diameter.)


FIG. 10.—SLITTING DISC. (8 inches in diameter.)

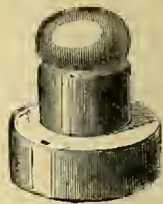


FIG. 7.—DIAMOND CRUSHING MORTAR (HALF SIZE).

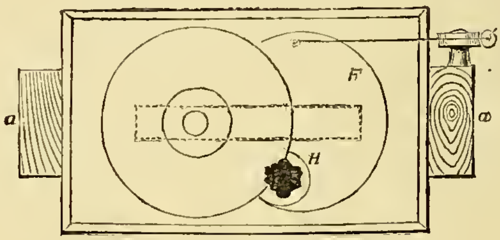


FIG. 4.—SELF-ACTING APPARATUS—PLAN.

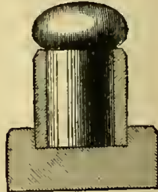


FIG. 8.—SECTION OF MORTAR.

FIG. 2.—STONE MOUNTED ON HANDLE.


FIG. 6.—GLASS ROLLER AND HANDLE—QUARTER SIZE.

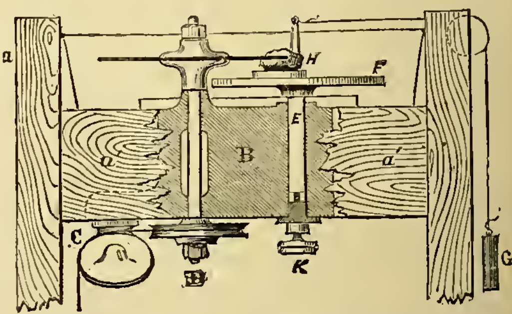


FIG. 5.—SELF-ACTING APPARATUS—SECTION.

according to the hardness and other qualities of the stone to be polished. The lapidary always uses the same class of tools whatever be the stone he is cutting or polishing, but the wheel discs or laps vary, and also the substances he uses with them. The operation of gem cutting is abridged by two methods: first, by cleavage; second, by slitting, as already described, or, as is sometimes done, by cutting off slices with a fine wire coated with diamond dust, and fixed in the stock of a band saw. Diamond is the only precious stone which is cut and polished with diamond powder, soaked with olive oil, upon a mill plate of very soft steel. Oriental rubies, sapphires, and topazes, are cut with diamond powder soaked with olive oil, on a copper wheel. The facets thus formed are afterwards polished on another copper wheel, with tripoli, tempered with water. Emeralds, hyacinths, amethysts, garnets, agates, and other softer stones, are cut on a lead wheel, with emery and water, and are polished on a tin wheel with tripoli and water, or on a zinc wheel with putty powder and water. The more tender precious stones and pastes are cut on a wheel of hard wood with emery and water, and polished with tripoli and water on another wheel of hard wood.

I hope the description of the process by which pebbles may be cut and polished, may interest my readers and prove of service to them. It may perhaps be of use to some if I conclude this article by giving the prices at which the materials mentioned can be purchased, and where they can be obtained. The complete lapidary's bench, beautifully finished, of mahogany, fit to place in any library or even drawing-room, costs twelve guineas. This apparatus is used and approved by professors and geological societies all over the world. It is used in the South Kensington Museum. The extra laps cost, in brass, 30s.; in gunmetal, 32s. 6d.; in copper, 35s. The price of cutting and polishing materials is as follows :—

Tripoli powder, 1s. per lb.; Crocus powder, 1s. per lb.; Putty powder, 4s. per lb.; Emery powder 9d. to 1s. per lb.; Oil of Brick, 4s. 6d. per lb.; Diamond bort, 12s. 6d. per carat. All the above articles of the best quality, also laps, slitting discs, diamond mortars, and the complete lapidary's apparatus can be obtained from The Leicester Utility Company, 10, *Yeoman Lane, Leicester.*

The artificial colouration of agates, etc., as previously referred to, depends for its success on the variations in texture and density of the various layers of which the stone consists. Black or dark brown colours are those commonly developed in agates—these dark strata when alternating with dense white layers, forming beautiful onyxes well fitted for cameo-work. To produce the dark colour, the stones, having been well washed and dried, are placed in honey, thinned with water, and are exposed in a warm place for several days, in some cases as long as three weeks. The vessel containing them is heated by being placed in hot ashes or on a stove, but the syrup is never allowed to boil. After having lain in the warm honey for a sufficient time, depending on the texture of the stone, they are removed, well washed, and placed in a vessel with sufficient commercial oil of vitriol to cover them, the vessel being covered with a slate and exposed to a moderate temperature. The sulphuric acid carbonises the saccharine matter previously absorbed by the porous layers of the agate, and produces a black or deep brown colour according as the action is more or less intense. Olive oil is used by the Italians instead of honey. Some stones blacken in a few hours, others require several days, while bad stones never take colour. When sufficiently tinted the stones are removed from the acid, washed, dried, and polished; they are then generally laid in oil to improve the lustre, and are finally dried in bran. If the darker parts of the stone should be too deep, the colour can be "drawn," or made lighter by the action of nitric acid. The art of colouring agates is now so advanced that stones can be tinted of almost any desired hue. One of the best modes of producing a blue colour is to submit the stone successively to the action of solutions of yellow prussiate of potash, and of a per-salt of iron, thus causing a precipitate of prussian blue to be thrown down in the pores of the stone. Green is produced by nitrate of nickel or chromic acid. A yellow colour is obtained by prolonged digestion in warm hydrochloric acid. A red colour is obtained by exposing the agates to the heat of an oven gradually raised until all hygroscopic water is expelled. The stones are then moistened with sulphuric acid, and raised to a red heat when a fine red colour is developed.

A SMALL CABINET FOR AMATEUR WOOD-WORKERS.

By D. B. ADAMSON.

(*For Working Drawings of the Different Parts of the Cabinet, see Folding Sheet issued with this Part.*)

THE small Cabinet here represented is a very suitable piece of furniture for the amateur workman in wood to make, and for any one who may be intending to make a large article, such as a sideboard, the experience gained will be especially useful, all the construction and *modus operandi* being similar, only on a smaller scale

The design of this cabinet is equally suitable

for American walnut, ebonized wood, mahogany, or rosewood. If it is going to be finished as an ebonized job, it may as well be made of Honduras mahogany, or bay wood, which is much cheaper than Spanish, and takes the stain equally well, besides being more easily worked. Another good wood for ebonized work is American bass, a white wood, which, however, is not so readily procurable, and would cost little if any less than Honduras.

A glance at the front elevation and side elevation of the cabinet in Figs. 14, 15, will show that the cabinet consists essentially of a lower part, in the upper half of which is a two-door cupboard. A back with shelf above, a plate of silvered glass, and below four small carved panels, these being surmounted by a cornice and pediment.

Before proceeding to make this cabinet, or indeed any piece of furniture, a full-sized working drawing, showing all details of construction should be prepared; without this it will be almost impossible to turn out satisfactory work: therefore any care or trouble bestowed on it will not be wasted. Working drawings are often made on paper, but are much more convenient in many ways if made on wood. This, however, is a matter of detail, and provided the drawing is made, the material it is on is not important. The drawing being ready, it will be found that the principal dimensions of the cabinet are as follows:—

	ft.	in.
Extreme width of top across front ...	2	6
„ ditto of top from front to back	1	3
Height to top of lower part	3	2
„ over all	4	$10\frac{1}{2}$

In accordance with these measurements, the wood must be cut out. As the top, bottom and ends of cupboard and shelf near the ground, will probably have to be jointed to get the width of wood required, this may as well be done first, in order that the glue may be set and firm by the time we are ready for these parts. The joints can be either dowelled, or grooved and tongued. The sizes for these parts will be for the top 2 feet 6 inches long by 1 foot 3 inches wide, and the thickness $\frac{3}{4}$ inch. I may here say that all measurements given are those of the wood when finished, so that due allowance ought to be made when cutting. For the bottom of cupboard and shelf below, two pieces each 2 feet long by 1 foot $1\frac{3}{8}$ inches wide, of same thickness as the top. For the ends two pieces the same thickness, 1 foot $5\frac{3}{4}$ inches long by $11\frac{3}{8}$ inches wide. Supposing all the wood cut out and ready to hand as wanted, the framing of back and door should now receive attention. All the joints should be mortised and tenoned in this part of the work, including the divisions between the four small square panels above the shelf. B, Fig. 1, shows the section of framing, with moulding, etc., full size. The rail to which the shelf is fixed should be double the width of this plus the thickness of the shelf which will be fixed along the middle of it. The mortises and tenons being cut, rebate the framing at back, and work mouldings along front edges. We are now ready to mitre the mouldings and fit together. The parts must not, however, be glued yet, as they will have to come asunder again. If the carving is to be done by another, it will be as well to get the panels cut at this point, in order that the carver may get on with them and have them ready by the time the cabinet is done. The pediment and brackets on which there is any carving should also be got out now for the same reason. If, however, the amateur workman wishes to do the whole of the work himself, panels, etc., can remain over till later on. It will be seen that I have shown a different pattern for each of the small panels of the back, and some may prefer to have the same carving on all. If so, well and good, but an amateur will probably take more interest in carving a set which though similar in character are different in detail, than in repeating the same thing four times. The general appearance when finished will also be better, and more in harmony with the principles of true art. The glass below the shelf should also now be measured for. It should be plate silvered, and have the edge bevelled. As bevelling and silvering hardly come within the scope of an amateur, this part of the work will be put out, and, when ordering, the width of bevel required should be stated. The full size of plate should be $\frac{3}{8}$ inch larger than sight size; that is the size of plate visible when fixed in or between the mouldings. The rebate for the glass will probably be larger than this, so that the plate will not fill the entire space. This does not matter, as the method of fixing the glass in will be explained in due course. The reason for not hiding more of the glass behind the rebate is that the cost of bevelling depends on the width of the bevel, so that it is simply waste to hide more of it than is absolutely necessary. For a plate of the size for this cabinet a $\frac{3}{4}$ inch bevel is sufficient. If preferred to carved panels in door and above shelf, bevelled plates may be used instead, the same proportions being taken. Those in the door may be either silvered or transparent, and should fill the whole of the rebate especially with the latter.

The ends may next be fitted to the uprights, the mode of fixing them being by dowels. These being fitted, we now do the same with bottom of cupboard and shelf below. They should be dowelled into the uprights and housed into them at the back of the front, and the front of back uprights; or, if preferred, rails at each end may be mortised into the uprights, from back to front on which the shelves can rest, and

to which they can be screwed from underneath. The front rail and bracket are shown on Fig. 8. This should be housed and dowelled into the uprights. If not done already, the mouldings can be run along the fronts and ends of these shelves, and the top, as shown B, Fig. 2. The top may then be lined up; C, Fig. 2, shows the section of this at the ends. The lining in front need not be so wide, 2½ inches or 3 inches being quite enough. The corners should be mitred, and the front framing only glued on, the ends being fixed by screws. In connection with these ends the following may be a useful wrinkle : Instead of boring the screw holes in the usual way, cut mortises in the direction of the grain, and pass the screws through them. In the event of the top shrinking, as the best seasoned wood will sometimes do, the mortises allow of a certain amount of play, and the risk of the top splitting is reduced to a minimum. This plan is adopted in some of the best cabinet factories, though it is by no means general, nor, in most cases, necessary. Two rails should be fitted at top of ends of cupboard, one near the front and the other near the back, the lap dovetail being used.

As these rails are not seen when the cabinet is finished, they may be of pine or any other wood. They are only required to screw the top to, and to afford support to the frieze in front, and to the back-board behind. Their width and thickness are not important, but 2½ or 3 inches will be found a useful width in practice. The front is shown in section C, Fig. 3. The block, D, underneath it is merely used in the event of the frieze requiring additional support. The frieze should be fitted into the uprights either with mortise or tenon, or a couple of dowels at each end. The mouldings (B, Fig. 5) to be planted on face of frieze, should now be mitred ; they are fixed on with glue, and perhaps two or three small screws from behind. We will now suppose that the whole of the framing and carcase are ready fitted, and if we chose, it might be glued, screwed, and cramped up. It will, however, be an improvement if this is delayed till after the polishing is done, as after the job is made, it will be impossible to polish as cleanly as while it is in parts. Of course, after the cabinet is fixed together, it will need to be gone carefully over to touch up any parts that have got scratched or rubbed. It is not within my province to go into the details of polishing further, all necessary information being obtainable from the excellent articles on this subject which have already appeared in AMATEUR WORK. Before beginning to polish, the cornice may be worked; it will be better to mitre the ends of this rather than run mouldings on them. The shelf on back, pediment, and any brackets, should also be cut now if they were not got out earlier for the carver. The carved pattern, A, on Fig. 2, is the same as on pediment ; every part should now be cleaned up, and any errors in fitting or squareness having been rectified, the polishing may be proceeded with. When this is done, we may begin to fit the parts together permanently. The shelves, rails, and frieze, must be glued up and left to set, and before finally cramping up, see that everything is square. The back may now be done in the same manner. We can then screw the cornice down on to it, and the pediment on top ; screw the top on to the cross rails from underneath, fix the brackets under the top with a dowel into the uprights, and a screw driven in from under, and do the same with brackets at ends of back. The carved panels of back should now be fixed in with small beads mitred at the corners, and the bevelled glass may be blocked up. In the event of this not fitting tightly into the rebate, lay the back face down, and put the glass in so that the mitres run exactly into the corners of the mouldings. We can now judge by the distance between the edge of the glass and the framing, how to cut out blocks. These may be a couple of inches long, and triangular, so that the side, A, presses against the plate, while the upright, B, is glued to the framing. If it should happen that the rebate is very wide, it may be necessary to cut a little of the edge, C, away. A good plan is to fit all the blocks in first without glue, till the plate is firmly fixed. Two or three of these wedges, along each side of the plate, and one at each end, will be enough for a small plate like this, and if bevelled glass plates are used instead of carved panels, one on each side of a plate will be sufficient. The back of the glass ought to be protected by a backing of thin wood which should be neatly rounded off on the outside edges, and screwed on to the back. Fix glass, if this has been chosen, in doors in the same way, if the plates are silvered, with a similar backing. Transparent plates, however, should fit exactly into the rebate, and be fixed in with beads in the same way as wooden panels, there being no way of hiding blocks which would look unsightly. Instead of screwing the backing on to the framing behind glass plates, another way may be adopted, *i.e.*, the glass blocks may be cut down low enough to allow of a panel, the exact size of rebate, being let in and beaded. This way, of course, is more suitable with a thick framing than a thin one. Before screwing the back into its place on the cabinet, the backing of cupboard should be put on ; this may be of thin wood, or a framed panel, sunk into a rebate, in the back uprights and the bottom of cupboard. The top of it should be screwed against the top rail to which the top is fixed. The back may now be fixed on two or three screws through the overhanging part of top, and a couple of screws through each of the extended ends of back

framing (A, Fig. 4), into back uprights, will make this secure.

I have omitted to mention that places must be cut out of the overhang to take these extensions. Another way is to cut out the whole of the overhang except at the ends on which the brackets rest, and screw the back *against* the top instead of on to it. If this is done the bottom rail of framing under the glass must be wider by at least the thickness of the top. The back being on, the shelf and brackets belonging to this part may be fixed, the brackets being first dowelled into the shelf. We have now only got to fix our doors, the right-hand one having the lock. What are known as "tipped" butts should be employed instead of the ordinary hinges. They are a little more expensive than plain butts, but they have a better appearance. I believe they are to be had at almost any cabinet brassfounder's, but in case any difficulty is experienced in procuring them, Bose Bros., 69 and 71, *City Road*, *E.C.*, may be mentioned as keeping them in stock. A small stop should be mortised into bottom of cupboard to prevent the doors being forced too far back. The door on the left hand should be fitted with a flush bolt at top or bottom, or both. One or more shelves inside will probably be found useful. They can be simply laid on strips screwed to the ends, or they may be made changeable to different distances apart by any of the usual arrangements for book-case shelves. Perhaps the neatest of these is the brass peg method. If the doors are fitted with transparent glass it will add greatly to the appearance of the cabinet, and also set off the contents, if the shelves are covered with plush, say to within an inch of the front. The shelves may be of pine, with front faced to width of an inch back with whatever wood the cabinet is made of. The back of cupboard inside may also have a sheet of silvered glass which need not be bevelled. This greatly lights up any ornaments that are in the cabinet, but would not be of much advantage if there is more than one shelf.

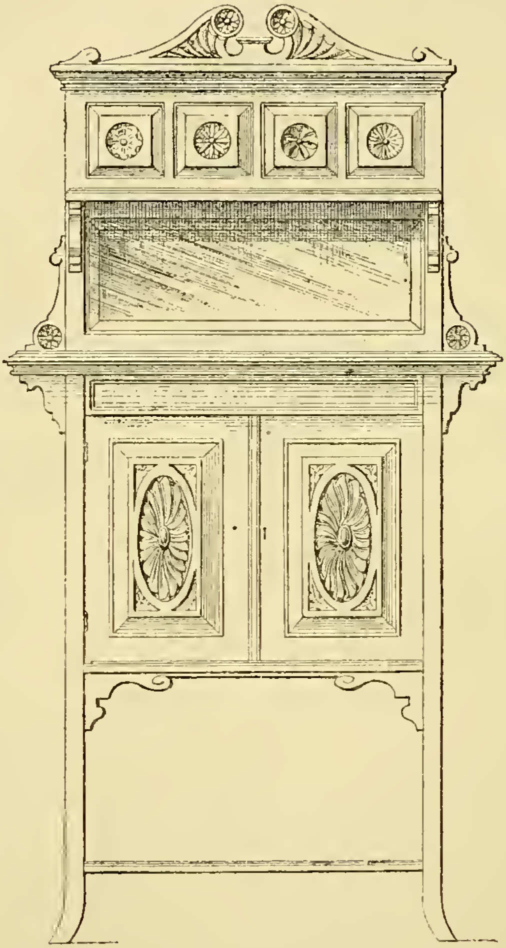


FIG 14 FRONT ELEVATION OF CABINET *Scale, 1in.-1ft.*

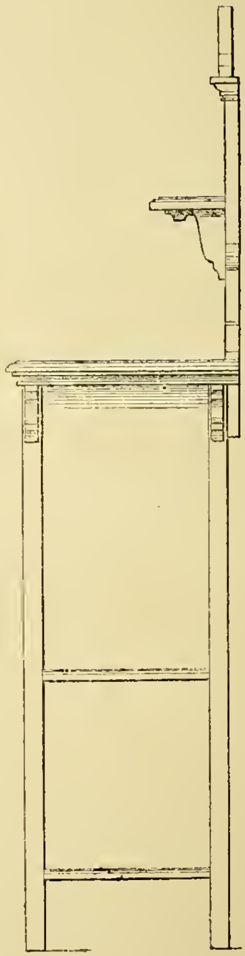


FIG. 15 SIDE ELEVATION

After a final touch up to the polishing, our cabinet is complete, and let us hope that it may prove to be a thing of beauty and a joy for ever. I have not considered it necessary to go closely into the minutiæ of how the different parts are done and the tools that are required, nor have I more than incidentally alluded to the necessity for squareness, as I presume no one who has not mastered at least the rudiments of working in wood will attempt to make a piece of furniture of this sort, the beauty of which depends to a large extent on accuracy and neatness in workmanship.

The parts of this cabinet are all small, so that if any inaccuracy or bad joint be noticed, do not pass it, but relegate the offending piece to the "short ends" corner. A good deal is heard now-a-days about the superiority and honesty of work in old furniture, but

if this cabinet is made according to the directions given, no one will be able to assert with truth that it is not equally as durable as any piece of furniture made by our forefathers. The amateur must remember that he is not under the same temptation as his professional confrere to turn out a given quantity in a certain time or at a certain price, so that he has little excuse for allowing a piece of scamped work to pass. The amateur has only to please himself, whereas the professional has to please the public who, in too many instances, are to blame for the quality of work turned out by some cheap cabinetmakers.

If the instructions I have given are not sufficient, I shall be happy to give further, if anyone *after using his brains* will write stating the point on which he wants information to the Editor, who has my address, which he is at liberty to give anyone who would prefer seeing a piece of furniture ready. This may be useful to London amateurs.

FISHING TACKLE:

ITS MATERIALS AND MANUFACTURE.

By J. HARRINGTON KEENE.

X.—FLY MAKING IN ALL ITS BRANCHES (*Continued*).

A MORE complicated and somewhat more difficult palmer is thus made. I give it because I want these papers to be, above all, educational and progressive. Suppose you are going to dress the black or golden palmer. Having completed the first operation of connecting gut and hook, put on your red hackle with only one lap of silk, then by the side of that fasten on your gold twist or tinsel with one lap, and attach your herl with two laps; cut away the butt ends of all three, and wind the herl four or five times closely round the shank of the hook in direction of the bend, then take the gold twist and wrap it in the same direction three times round the herl; after that take your red hackle by the point, and wind it in thick laps over all. Now withdraw, in a backward direction towards the end of the shank, the herl, and twist and make fast to hackle with two laps of silk. Again take the ostrich herl, and wind it thickly three or four times round the hook towards the bend; then rib with windings of the twist to the last lap of the herl. Fasten with two cloven hitches opposite the barb of the hook, and the affair is completed.

How to Make a Fly with Wings and Dubbing for Body.—The process of making a winged fly is considerably more difficult than the simple making of a palmer, and this must be the next step to be taken. Attach gut and hook as before described, having, of course, fixed the hook in the fly vice, as shown in Fig. 106; then strip a sufficient quantity of fibres from the feather of a starling's wing, or from that of the wing of any bird mentioned in our fly making materials, and place it on the back of the shank with the roots towards the bend, and the points of your feather towards the right hand, then lap the silk at a short distance from the end of the shank twice round the feathers and the shank. With your right hand thumb nail force upright all that part of the wing which lies to the right of the silk laps, divide equally and exactly into two parts on each side of the shank your feathers, so as to make two wings of exact proportion, the one with the other, in every respect. Then bring the silk under that wing which is nearest to you, and over it through the separation of the wings in the direction of your vice; next, bring the silk round the wing on the left hand side of the shank, drawing it towards your left through the separated wings. pass the silk once more, as you did in the first instance, through the wings. Now cut off the roots of the wings, and bending the points of the wings by taking them together between your right thumb and forefinger down towards the bend of the hook, and holding them down on the shank firmly in that position, lap your silk three times between the bent-down wings and the point of the shank. This operation forms the head of the fly, and serves to keep the wings from falling back, and to retain them in their upright condition. Now take your dubbin, whatever it may be, mohair is, perhaps best for beginners, and having well waxed your silk, lay it evenly but thinly round it, spin the silk sharply three or four times round between the ball of the thumb and the forefinger, which will cause the dubbing to stick round it evenly and firmly, and then take your silk with the dubbing spun neatly round it, and lap it close under the wings on the side next the bend four or five times, or until you see there is sufficient dubbing lapped round the hook to form a body of proper length and thickness. Then re-wax your silk, in order to clear off the dubbing that is not wanted, and, lapping your silk twice round the shank, fasten with a cloven hitch. Now examine the shape of your fly, and if the dubbing seems unevenly distributed, pick it out with your picker, or clip with your scissors when too much exhibits itself.

How to Make a Grouse or a Wren's Hackle.—Lap the hook and gut together in the usual way. Strip off the fine fibres from the quill end of such feather as you are going to use, and, instead of placing that end to be first whipped on to the shank of the hook as you did in dressing the simple hackle, you must fasten on to the shank the tip end of the feather, having first made a separation in the fibres of your

feather for the silk to pass through without obstruction. This separation is made by forcing from opposite points of each side of the stem the fibres backward towards the root of the feather. Whip your silk twice round the point of the feather at the place where the fibres are separated, and then cut off what remains in the direction of the bend at that point. Now take between the forefinger and thumb of the right hand the thick end stem of the feather and wrap it twice round the shank in the direction of the bend, make two laps over the feather and cut away what remains of it. Fasten as before.

How to Make a Winged Fly with Hackle for Legs.—Whip on your silk and gut according to the directions given for the making of a plain hackle, and tie on your wings according to the instructions "How to Make a Fly with Wings and Dubbing for Body". Having completed these operations, strip the downy fibres off the thick end of your hackle feather, and fasten it close into the ring on the bent side with two laps of silk. Cut off the thick end of the stem of the feather; with your right hand, draw back towards the point all the fibres of the feathers in order to separate them distinctly, so that when the feather is wound round the hook, the fibres may sit more regularly. Next take the hackle in your right hand fingers by the point, and lap it round in close laps under the front of the wing down towards the bend. Having done this, whip your silk twice round the point of the feather, and clip off at that point. Then fasten as before.

Fly with Wings, Dubbing for Body, and Hackle for Legs.—Proceed as before, until you have tied your wings, then attach your hackle with a single wisp of the silk, twist your dubbing on the silk as before directed; having done so, lap your dubbing close under the wing, and over the stem of the hackle and hook three times, then clear away the superfluous dubbing, using the wax for that purpose. Now take your hackle by the point, and lap it over the dubbing three times, cut off what remains of the point of the hackle, and fasten as before.

To Make a Fly with Wings, Dubbing for Body, Hackle for Legs, and Ribbed with Gold or Silver Twist.—This is how the sand fly was originally made, and to properly manufacture it requires very high skill. The learner will see that there are four different materials employed in its make up, and if these are not neatly and properly put on, the result is a caricature of the actual insect, and not a likeness. Having put on the wing in the usual way, he must fasten his gold or silver twist with one lap of silk directly under them. He must then fasten by the side of his twist the hackle with one lap of silk also. He must then cut the ends of his twist and hackle away, then the dubbing is placed on the silk and twisted round the hook sufficient to form a body; over the dubbing he must lap the twist two or three times, and then both over dubbing and twist. Close to the wing of the fly let the hackle be wrapped three times; he must fasten the point of the hackle with one whip of the silk, and then clip off what remains of the point of the hackle. He must now whip the silk twice or thrice toward the bend, and over that take two laps with the twist. The silk may now be brought down to the bend, and finished off as before.

These directions, if followed out and practised with patience and an intelligent interest, will thoroughly ground the learner in the general art of fly tying. Of course, salmon flies are creations of a far different kind, and as they resemble nothing living, it is necessary for the tyro to buy or procure otherwise his pattern before he can imitate. I shall refer to these anon. Meanwhile, the excellent directions given by the late Ogden, of Cheltenham, as to that invention of his, "the floating fly," are worthy our consideration, inasmuch as that it is not too much to say, that this veteran trout fisherman almost revolutionized our ideas in regard to fishing in clear waters by their introduction. To omit the floating fly, and especially the floating May Fly, would therefore be a grave error of judgment in the writer of this little treatise.

Here are Ogden's instructions, *in extenso*, which I extract from his capital little book on fly tying: "To commence, fix your hook firm in the jaws of the vice (see Fig. 106), leaving sufficient of the shank out to the right to form the body of the fly. Put three turns of waxed silk round the shank of the hook, leaving less than the eighth of an inch bare to wing and head upon. Take a length of gut . . . test it . . . lay it underneath the hook, and wrap down with the waxed silk close and even . . . the smoother the foundation, the better the fly will look. After wrapping down, try your gut with a steady pull to see that it will not slip, for that is unpardonable. Avoid making the body too long.

"If the fly you wish to copy has tails (and a good many of the Ephemeridæ have), take three strands of a large cock's hackle, either duns or reds, secure them with two wraps of silk, cut off the waste ends, give the silk a twist, and wrap close back up to the shoulder, still leaving the bare hook to wing and head on. This is a plain silk body, which I prefer. Now for setting on the wings, which is the most difficult part in making a midge fly. Commence with a starling wing, which should be smooth and clean; take a right and left wing, get a centre feather from each wing, strip off the fag end, and with the right finger and thumb divide as broad a piece as you wish one side of the wing to be. Draw the tips carefully down till quite even, without separating the

fibres, at the same time holding the quill and roots firm with the left finger and thumb, easing them occasionally to let the wings lay even and smooth, coaxing the fibres gently together. This being done, with the left finger and thumb hold the quill and the roots of the wing firm, while with the right finger and thumb press very tight, keeping the wing flat, and with a sharp twitch separate the wing from the quill, taking care not to slack your hold or disarrange the fibres. Lay it carefully down on the work-table, the outside of the feather uppermost. In precisely the same manner take a wing from the other feather exactly the same size as the one first taken off; when done, place it carefully on the inside of the forefinger of the left hand, the inside of feather uppermost, and the roots of wing pointing to tip of finger. Pick up the other half of wing (which I do by moistening the tip of forefinger of right hand, and put it to the other half of wing). Lay the tips very evenly together, and (inside of feathers facing) press them together, keeping them flat, and without altering their position place them on the top of the bare hook. For length, they should reach to the bend of the hook, but no longer. Take the tying silk in the right hand, open the left finger and thumb slightly at the tips to allow the silk to pass up and down, then close and press tight, at the same time drawing the silk very carefully down, or it will break on to the roots of the wing. Take two more turns of the silk in the same manner, keeping all the time a gentle strain on the silk, or the wings will twist round. Pass the silk securely round the screw of the vice, and release the left finger and thumb, to see if the wings are set properly. If so, draw your gut carefully on one side, avoiding the shank end of the hook, as it will sometimes fray it. Turn off the roots of wings neatly with a sharp pair of scissors. Then take two turns of silk on the head, holding the wings as before, not allowing the silk to slack or the wings to draw out. Pass the silk behind the wings, ready to tie the hackle in, which should be proportioned to size of hook, and tapering. Strip the fluff off the hackle, and take it in the right hand, root downwards, the outside part of hackle to the right; tie it in sideways, close behind the wings, with two turns of silk, taking care not to disarrange the wings. Cut off the quill end of hackle, not too close, or it will fall out. With the tweezers (Fig. 108) lay hold of point of hackle, keep it well on the edge, and put two or three turns behind the wings, bringing the hackle well forward underneath. Secure it with one wrap and two hitches before taking the tweezers off, cut off silk and point of hackle, press it well back from the head, open and adjust the wings with the scissors' point, and cut away any stray fibres; the fly is now finished." Fig. 113, of the Blue Dun, will illustrate the foregoing sufficiently to bring home the writer's meaning. The following is the approved dressing, however: *Body*, fine fur of hare's-ear or face, twisted on yellow silk; *tail*, two fibres of dun-coloured hackle; *legs*, two or three turns of a red hackle, finishing at head; *wings*, of starling wing feather.

I have thus given rather lengthily, and perhaps to the uninterested reader, most tediously, the various items of fly manufacture. Not one has been unnecessary, and there is much I must perforce omit, on account of space, which, for the most part, no doubt will eventually be discovered by the persevering tyro. One very important fly must not escape description however, and that is the Mayfly. Fig. 114 gives a very fair representation of the insect, which, on streams such as the Hampshire Itchen and Test, fairly turn the heads of enthusiastic anglers on its rising in early June—for the term Mayfly is a misnomer.

Mayfly.—Here is a capital dressing of the fly—for floating—indeed, I can safely say it is the best dressing ever arrived at. First, get a suitable hook with the smallest amount of iron in it possible, and tie on your gut; let this be fine, but not too fine, or there is a danger of popping the fly off when fishing. Tie on the tail three whisks of brown hen, or pheasant, then take a slip of nice wheat straw, cut it to fit round the shank of the hook so that it tapers. To ensure this, soak the straw in hot water, and bring it up to the shoulder of the hook, lash it round with some burnt sienna silk, taking, say, some half-a-dozen spiral turns, and finish off at the tail with three turns. At the shoulder you should have three turns of a light sandy hackle, and over this, two turns of a bright Florican hackle wing. Teal will do capitally, or drake, or Egyptian goose, or Canadian wood-duck, and they should be set upright with the points outward. For the green drake, these should be dyed, as advised. Two turns of peacock herl to form the head completes the fly, and it will kill trout when all other imitations fail. This I have repeatedly proved.

Anyone who has followed the foregoing with intelligence, will be ready now to take notice of the formulæ I shall give for the making of the chief trout flies of the year. Again let me impress on the reader that it is highly desirable to either procure Ronalds' book, wherein the colours are capitally shown, or the real insect—best of all plans—or flies, tied by acknowledged chiefs of the fly tying art, as patterns. The dressings I am about to give are those in most approved use, and are necessarily, therefore, not original, though in all cases I have tried each pattern with success; those which did not seem to possess the elements of efficiency, though advocated by, in some cases, the highest authority, I have not hesitated to discard.

February is sufficiently early for trout fishing, and I therefore begin with the favourite lures for that month.

The February Red, or Old Joan.—Body.—This is formed of a dubbing composed of the dark red part of squirrel's fur, mixed with claret-coloured mohair, showing the most claret at the tail of the fly, and spun on brown silk; wings from the softest quill feather of the peahen's wing; legs of a claret-coloured *stained* hackle (see dyeing feathers). Hook 2, Kendal short (Ronalds'). Another dressing. Body.—Two turns of dirty claret, red mohair at tail, and a strand of hare's ear, and claret thrown in for rest of body. Hackle, dark grizzled dun cock's. Wing, a slip from back of the peahen. Hook, 9 or 10, or larger for rough weather (Francis).

The Olive Fly.—Body of dark olive mohair; wing, a starling's wing feather to stand upright; tail, two whisks of a mottled mallard's feather to be tipped with a lap of silver tinsel. This is poor Fitzgibbon's formula, and a good one it is.

For such rivers as the Barle, Exe, Taw, Lynn, Bray, Mole, Dart, Teign, and other Exmoor and Dartmoor streams, I know of no flies for this month to compare with those recommended by Mr. Cutliffe, in his " Art of Fishing Rapid Trout Streams." He gives eight patterns, distinguished by no particular names. No. 1. Body.—Equal parts of fox's and squirrel's fur from the back, hackle or legs of rusty brownish hue. No. 2. Body.—Equal parts of house rats and light brown sables' fur, or fur taken from the tail of the brown sable alone; legs, speckled brown silvery. No. 3. Body.—Dark peacock's herl, ribbed with gold twist; legs, black red. No. 4. Body.—Equal parts of hares' flax dyed yellow, water rat's fur undyed, and rabbit's flax undyed, ribbed with straw-coloured silk; legs, smoky blue. N.B.—This is a greenish coloured body. This fly may be made up lighter or darker, both in body and hackle. No. 5. Body.—The same as No. 2, ribbed with gold twist; legs as brown or drab coloured as can be got. No. 6. Body.—Equal parts of brown bullocks' hair, and of the ends of squirrels' fur, ribbed with gold twist; wings, pheasant, or hackle, blueish red. No. 7. Body.—The black flax from a rabbit's tail, some flax from the eyelid, ditto from the back, and from a skin dyed in the yellow dye (see below); wings, from thrush; hackle, blue to match the body. No. 8. Body.—Finest cow hair such as you can pick out of a wren's nest, ribbed with straw-coloured silk; hackle, dark rusty blue.

It will be seen that these flies are, with but one or two exceptions, unwinged; wings are of but little utility in very rapid water. The yellow dye referred to is a strong infusion of turmeric, in which a lump of alum has been dissolved, and in which the furs are boiled for a few minutes. Of course, the bodies are composed of dubbing, spun on silk, as before directed. The flax of any animal referred to means the tips of the fur, not the roots included, the latter always being much lighter.

Flies for March.—The Cowdung.—Body of yellow worsted or lambs' wool, mixed with a dingy brown fur, spun on light brown silk, and left somewhat rough. Its wings are from the landrail, and its legs of sandy-coloured hackle. The *Peacock* is a small beetle, very plentiful, and killing on warm summer days. Body, peacock's tail of a ruddy brown, dressed with mulberry silk; wings, of the dark feather of a starling wing; legs, of a hackle stained dark purple. The *March Brown* is found both of the male and female "persuasion." Body of male is made of the fur of hare, face ribbed over with olive silk, and tied with brown; tail, two strands of a partridge feather; wings, of centre of a hen pheasant's quill feather when found of the exact shade; legs, a partridge feather of a sort of mottled brown. Best dresses it as follows: wings of the pheasant's wing, body of the bright part of hares' fur, mixed with a little of the red of the squirrels' fur, ribbed with yellow silk, and a partridge hackle wrapped over twice or thrice under the buff of the wings.

Flies for April.—The Sandfly.—Body of the sandy fur of a hare's neck, spun on orange tinted silk. A landrail's wing will supply the wings, and a ginger feather from a Dorking or other suitably-coloured hen will furnish legs. The *Stonefly.*—Body, fur from hare's ear mixed with yellow worsted, and spun on yellow silk; tail, two strands of partridge, brown; wings, pheasant's quill feather from wings; legs, greenish brown hackle. *Grannam.*—Body, fur of hare's face spun on light brown silk, with a little green silk worked in the end; wings from partridge wing; legs of sandy coloured hackle.

Flies for May.—Hawthorn Fly.—Body, black ostrich feather; wings, starling's feather; legs, pewit's topknot or blackcock hackle. *Black Gnat.*—Body, dark ostrich herl; wings, feather from starling's wing. Sometimes black, horsehair or silk is substituted for the herl in making the body. *Oak Fly*, or *Downward Fly*, is usually found on the oak with its head looking downwards—body, orange silk floss silk wound on grey silk; wings, a feather from a woodcock's head; legs, of a furnace hackle, or a black and red cock's hackle.

Flies for June.—The Yellow Sally.—Body of buff fur of a fine texture, spun on a bright green silk, or ribbed, if possible; wings, of a white feather of any fine kind stained a pale yellow; legs, a yellowish ginger hackle. The *Alder*, or *Oil Fly.*—Body of mul-

berry floss silk; wings, of a brown hen or peahen's wing; legs, of a dark amber-stained hackle, or, in an emergency, a blackcock's hackle will answer. *Marlow Buzz*, or *Cock-y-bouddhu.*—Body, black ostrich herl twisted with peacock herl, and made with red silk thread; the wings and legs are made buzz with a dark furnace hackle.

Flies for July.—The *Red Ant.*—Body, the body of peacock herl left *au naturel* as regards the lower or tail half, and tied in at the waist with

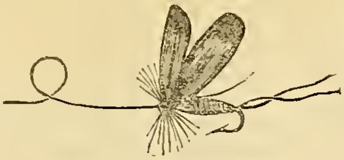


FIG. 113.—BLUE DUN FLY.

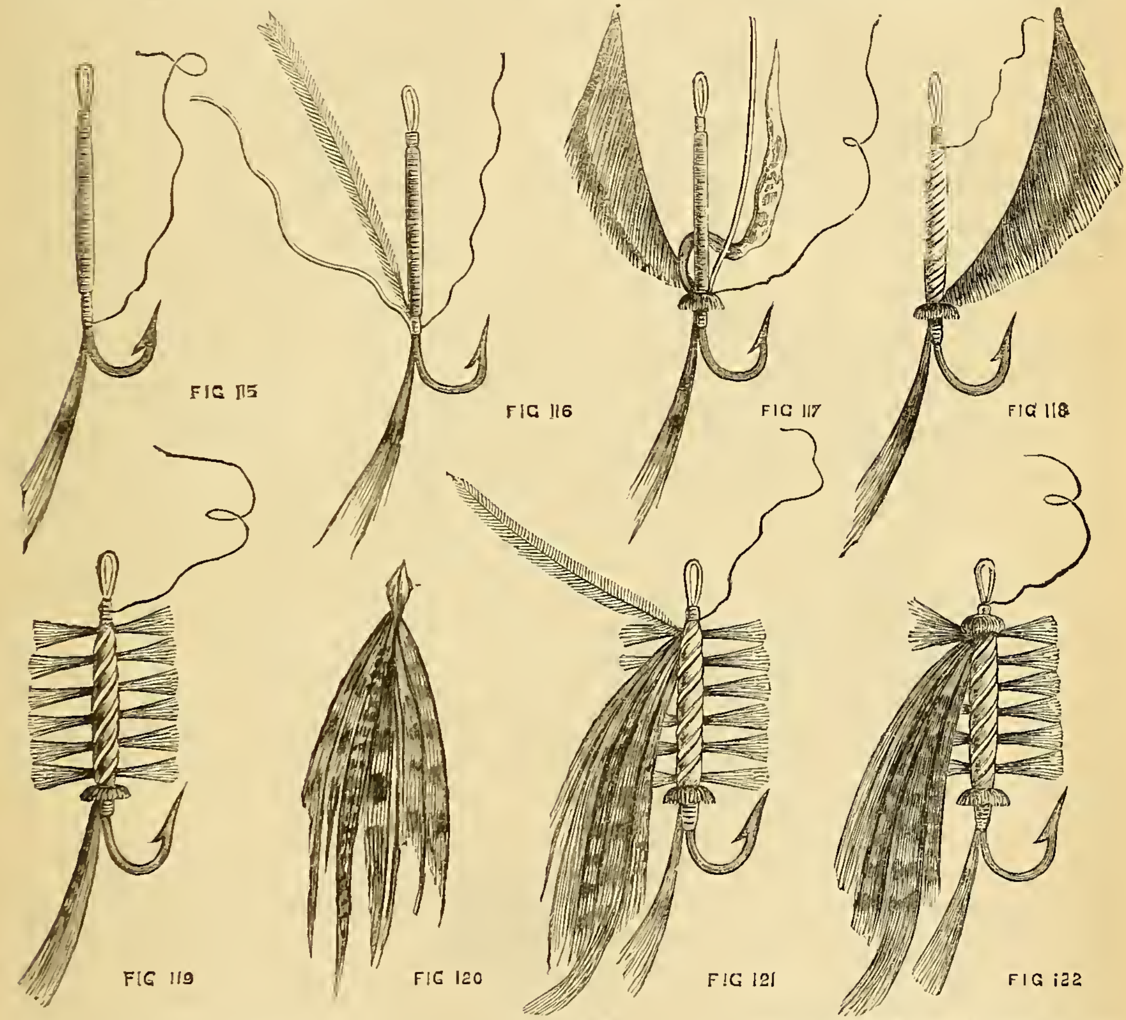


FIG. 115.—MODE OF SECURING TAIL. FIG. 116.—ATTACHMENT OF TINSEL ON TAG AND HERL. FIG. 117.—ATTACHMENT OF FLOSS SILK AND HACKLE. FIG. 118.—APPEARANCE OF FLY WHEN FLOSS SILK IS BOUND WITH TINSEL.

FIG. 119.—APPEARANCE AFTER PUTTING ON HACKLE. FIG. 120.—PROCESS OF WINGING FLY. FIG. 121.—METHOD TO BE FOLLOWED IN FORMING HEAD. FIG. 122.—APPEARANCE OF SALMON FLY WHEN FINISHED.

FIG. 114.—MAY FLY.

copper-coloured silk; legs, a red-cock's hackle, and wings of the light part of a starling's feather. *Little Orange Fly* (Ogden's pattern.)—Body made with deep orange-coloured floss silk; the legs put on flat from the water-rail or hen blackbird's wing; legs, a dark furnace hackle. *Cinnamon Fly.*—Body, fawn-coloured floss silk; wings, feather of a yellow-brown hen's wing; legs, ginger hackle.

Flies for August.—August Dun.—Body, brown floss silk, ribbed with yellow silk thread; tail, two

rabbit's whiskers; wings, feathers of a brown hen's wing; legs, plain red hackle stained brown (Ronalds'). *Whirling Fly.*—Body, squirrel's red-brown fur mixed with yellow mohair, and tied with yellow silk well waxed; tail, two strands ginger hackle; wings, darkish starling; legs, ginger hackle (Ronalds'). *Little Pale Dun.*—Body, very pale blue fur, mixed with a very yellow mohair; wings, feather from sea swallow; legs, palest blue hackle to be had. To make it buzz (or hackle fashion), a sea swallow's feather only may be wound on the same body. *The Willow*, or *Withy Fly.*—Body, mole's fur, spun on yellow silk; wings and legs, a dark hen's hackle, with the edges strongly tinged with a copper colour, sometimes called a golden dun feather. Made as above, with the addition of wings from the dark part of a starling's feather.

The above are representative flies, which should find a place in every angler's book, and necessarily, therefore, the tackle-maker should be prepared to supply the demand. There yet remains a class of flies, however, to which attention must be drawn, and these are, in anglers' parlance, termed the "Quill Gnats." They are imitations of certain of the smaller Ephemeridæ of our chalk and other streams, whose bodies are, so to say, ringed with bands of varying shades from the rest of the insect. The bodies are, therefore, variously made from quill, gut, hair, and sometimes of india-rubber; and it is according or otherwise to the accuracy of the imitation that sport ensues. Mr. Francis Francis says of these: "Body, a strip of quill from a starling's feather, neatly rolled on; legs, dark blue-dun cock's hackle—some prefer red hackle; wings, bright starling's wing. Pull the tail off, and the fly will pass muster for many other small flies which it somewhat resembles, throughout the season." This somewhat differs from my own dressings. I found it extremely hard to get the right sort of quill when I first fashioned this kind of fly. Get some good peacock "eye" feathers, choose the big ones, then turn the feathers so that the metallic lustrous fibres are downwards. You are looking at the back of the feather, and if you pick out those the quill of which looks lightest, you will find that there is a dark and light side to this quill, which is precisely the appearance most desirable on the body of the fly. Strip this off, and neatly wind it on your hook shank, giving a ginger hackle for legs, and a light starling feather wing put on upright, and you have the famous "red quill" of the Upper Itchen. Gut and horsehair dyed will serve for these flies admirably, under some circumstances, and bottle india-rubber, or even the rubber from an old boot, has before now enabled me to get a dish of fish otherwise inaccessible.

I have thus, in as succinct a manner as possible, laid the entire *rationale* of trout fly-making before the reader. If he perseveres, and does so with a determination to understand and profit by my instructions, he will satisfy himself *and the fish.* There is no royal road to fly-dressing, however. Practice unremitting, and study of the different forms of aquatic life, will alone perfect him. My own practice is to take a butterfly net with me whenever I fish and whenever I go near water, which, as I live upon the banks of the most productive part of the Itchen, is every day; and half a dozen pill-boxes are not very bulky to carry for the purpose of bringing home my captures. These are duly preserved for the longer evenings of winter, when an ordinary magnifying-glass discloses their tints and shapes. Colour and shape are all important in the artificial fly, and form must also be observed, but with certain reservations which may appear curious. Bainbridge, a most painstaking observer, says, on this head: "Although the imitation of nature is the principal object to be desired by the fly-maker, yet in some instances it will be advisable to enlarge or diminish the size of the artificial fly. If the river be very high, the fly may be dressed larger than nature; if very low, the size may be reduced, and the body made thinner than the natural fly appears." With these parting hints, I close this paper on *trout* fly-making, and pass on to that *chef-d'œuvre* of the tackle-maker's art—the salmon fly.

(*To be continued.*)

MY FURNITURE, AND HOW I MADE IT.

By MARK MALLETT.

VII.—A BACHELOR'S BEDSTEAD. CONCLUSION OF PART I.

OWING to the weight and strain to which a bedstead must necessarily be subjected, we shall in constructing one be obliged to secure a far greater amount of strength than has been required in our previous articles of furniture; and shall in our present undertaking not only need stouter timber than before, but also some iron work made specially for our purpose.

The bedstead which we propose to make will be of that description formerly known as a "trestle-bed," though we shall hope to render it somewhat more artistic than the generality of such things were wont to be; and it will have the advantage of permitting of folding up at pleasure. It is to be a "bachelor's" bed—intended for the use of one occupant only, and we imagine that it will be found substantial enough to bear any bachelor of reasonable weight. Its principal

dimensions will be: length, 6 feet 6 inches; breadth, feet 3 inches; and height of sacking from floor, 1 foot 6 inches.

The heaviest and most important parts of its structure will be the side-pieces, of which the head and foot ends appear in elevation in Figs. 52 and 53, and the head end in plan, in Fig. 54; these pieces are of 2-inch plank, 5 inches deep and 6 feet 6 inches long.

Three inches from the end at head, and 2 inches from the end at foot, are bored holes half an inch in diameter. These holes pass down through the centre of the side-pieces, and are to receive the irons which will support the head and foot-boards; they are marked A, in Figs. 52, 53, and 54. At 8 inches from each end is shown the mortise B, which receives the tenon of leg, as shown in section at C, Fig. 55. It should be observed that the side-piece shown in the illustration, is that on the sleeper's right hand; in that which will be on his left, the mortises will each be $1\frac{1}{2}$ inches farther from the ends, to allow for the folding legs crossing each other. The side-pieces are shown as finished at the ends with a half inch bevel, and if the edges of each piece between the iron holes are slightly rounded off, it will allow the sacking, which will presently have to be nailed over them, to lie more neatly and closely.

The legs which support these pieces are arranged diagonally, and will be seen in Fig. 55. They are of $1\frac{1}{2}$ inch stuff, 4 inches wide and 3 feet 6 inches long. At C, C, are shown the tenons by which they enter the side-pieces. As they are intended to fold, they simply cross each other, and are joined by a half-inch pin, which passes through the centre of their intersection. This pin is to be secured by a screw and nut on the inner side. These pins the amateur will probably be able to buy ready made; if not, any blacksmith can make them, and the cost, in either case, will be a mere trifle. I have shown the pin with an ornamental washer on the outer side. It will be seen that the edges of the legs are slightly bevelled off. The two pairs of legs are exactly alike.

To form the couch of the bedstead we shall have to stretch sacking from side-piece to side-piece throughout the space between the two iron holes, that is a distance of 6 feet. To give a firm grip and make the work thoroughly strong, it will be well to nail the edge of the sacking with strong iron tacks along the *lower* surface of the side-pieces, to turn it up over its outer side, and then to bring it across the top, where it may be secured with more nails. This will take a breadth of sacking measuring 4 feet 5 inches.

When the bedstead is folded up and the two side-pieces brought together, the sacking can be rolled up. But when the bedstead is in use, the sacking will be held tight, and the whole thing rendered rigid and immovable by the head and foot-boards, and that by simply inserting the irons attached to them into the holes marked A.

Of these two boards we will first deal with the more important—the head-board—a sufficient portion of which is shown in front elevation in Fig. 56. Upon this, as we wish to make our "bachelor's bedstead" artistic, we shall do well to bestow an amount of decorative work.

To form it we shall first need two $\frac{3}{4}$ inch boards, to run not only the whole width of the bedstead, but also to allow half-an-inch at each end for bevelling off, that is to say, they must be 3 feet 4 inches long; the upper one is to be a foot broad, the lower is to be half that width. We shall also need a strip of the same 3 feet 3 inches long and $2\frac{1}{2}$ inches wide, to run along the bottom. The edge of this last is seen and marked D in Fig. 56.

The upper board will be most readily shaped with a fret-saw. It is cut into the form of a pediment, scalloped above, and below fashioned into a series of semicircular arches, to give it a general resemblance to the decoration of our other articles of bedroom furniture. The notched ornament of the arches is the same as that used in previous designs. The lower board is left plain; it will be hidden by the bolster and pillows.

On the front of the upper board are screwed—"chevron-wise," as a herald would say—the two strips E E. These are 1 inch wide, and, like the narrower perpendicular strips which meet them, $\frac{3}{4}$ inch thick.

The six perpendicular strips are only $\frac{3}{4}$ inch wide. They are screwed up the faces of the two boards, and where in the middle portion there is no board against which they may be screwed, strips similar to themselves will have to be laid behind them, not as adding anything materially to the strength of the work, but rather for appearance. But of strength there will be no want. These eight strips, when firmly screwed in place, will effectually secure the boards, and make the head sufficient for all reasonable wear and tear, especially as it will be thoroughly clamped together by the uprights at the ends.

The front uprights (F, Fig. 56, and F, Fig. 52, in the latter it is seen in profile) are of 1 inch board, and measure 15 inches by 3 inches; the back uprights (G, Fig. 52) are of the same superficial dimensions, but only $\frac{3}{4}$ inch thick; and these two have to be screwed together into the ends of the cross-boards, which, as shown, are brought between them. In the spaces above and below the upper board, pieces of $\frac{3}{4}$ inch stuff must be placed, for appearance' sake. The illustrations show how a cap of inch wood, 4

inches by $3\frac{1}{2}$ inches, is screwed on the tops of the uprights by way of finish. To complete the woodwork of the head-board it only remains to screw the strip D along the bottom into both the transverse and upright pieces. It is $2\frac{1}{2}$ inches wide, and will come flush with the ends both before and behind, but will project $\frac{3}{4}$ inch behind the lower cross-board, and 1 inch in front of it, that is, $\frac{1}{4}$ inch in front of the bottom of the perpendicular strips.

Lastly, we have to mount the ends with the irons which fit the socket-holes in the side-pieces. These irons are so simple that they can scarcely need a separate figure. Their shanks, to enable them to pass well through the side-pieces, are $5\frac{1}{2}$ inches long, and in diameter $\frac{1}{2}$ in. Their flattened upper parts are 8 inches long. They should be fixed in place with $1\frac{3}{4}$ in. screws, that the latter may pass through the upright and enter well into the cross-board. I have drawn the irons of a somewhat ornamental form which the amateur can carry out or not, as he thinks proper It is a matter of little moment, as they will be almost or wholly concealed by the bolster and pillows. They will have to be made by the blacksmith, and, if plain, will cost a trifle less. It will, however, be important that the corresponding irons of the foot, which will be far more conspicuous, should be rendered decorative. To make these and the other ironwork look well, and to prevent rust, it will be well before screwing them on, to brush them over with Brunswick black.

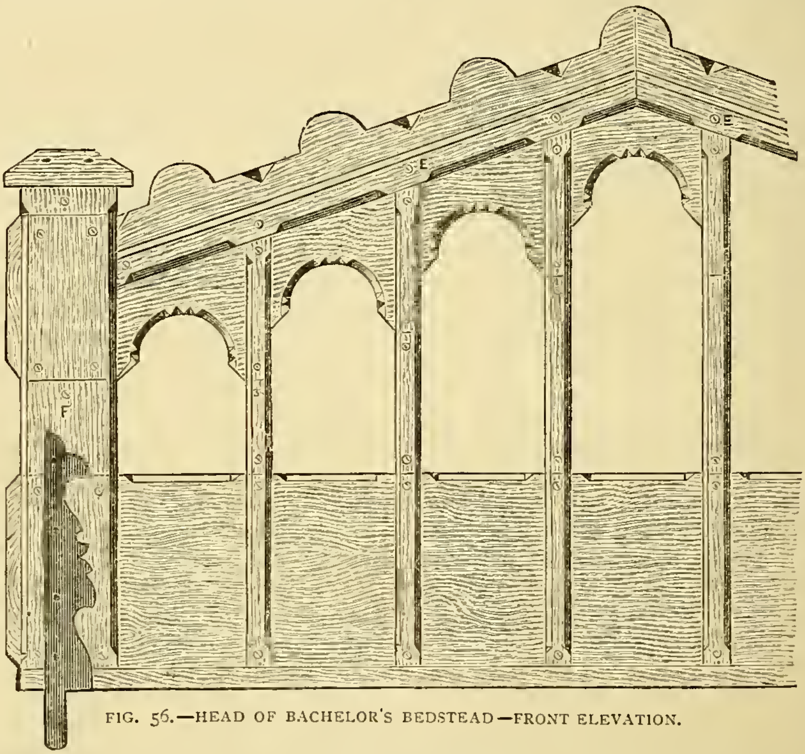


FIG. 56.—HEAD OF BACHELOR'S BEDSTEAD—FRONT ELEVATION.

The foot-board, of which the inner side (that towards the head) is shown in Fig. 57, is so simple that it can scarcely need an illustration on the larger scale. It is mainly formed by a cross-board, $\frac{3}{4}$ inch thick and 3 feet 4 inches long, like the cross-boards at head, but 9 inches wide. The illustration shows how it is shaped and scalloped so as to correspond with the head-board. As shown, it is raised 3 inches above the level of the couch, to allow for the fall of the coverlet. To effect this it is screwed to uprights at its ends, which are of 1 inch board, and measure 7 inches by 3 inches. To these the irons, which are 2 inches shorter in their upper part than those at the head, but similar in other respects, are screwed.

Of the illustrations to this bedstead, Figs. 52, 53, 54, and 56, are drawn on a scale of 2 inches to 1 foot ; but since in Figs. 55 and 57 it was desirable to give the whole breadth, the smaller (1 in.) scale has been adopted in them.

When I had finished my bedstead, I had made everything that was absolutely necessary for the equipment of my bedchamber, and I felt no little satisfaction and pride in surveying all that I had accomplished by a little perseverance, a fair amount of manual labour, and the appropriation of all the spare time that I could command and give up to the work in hand—time, perhaps, which I should either have wasted or employed to no profit, if I had not devoted it to my self-imposed task. I had placed the furniture I had made in an empty room, without any reference to order in its bestowal, for I was disinclined to use it until I had completed it *en masse*, making shift in the meanwhile with a few "sticks" that I had obtained for temporary use on hire from a secondhand dealer in the neighbourhood ; but as soon as my bedstead was absolutely ready for use, I placed this and the other articles that I have described in their proper relative positions in the room I intended them and

myself to occupy. This done, I looked around me, and I am sorry to say my heart began to show a tendency to retire into the heels of my boots. What was the matter? What could possibly occasion this feeling of disappointment that was beginning to steal over me? A moment's reflection, however, showed me that it was not in any way owing to anything wrong in the form or tone of the various pieces of furniture that were grouped around me, but in the surroundings that formed a setting to them. The paper of the room was far from being what it ought to be, and the floor was simply appalling in its nakedness. I soon remedied both, selecting a paper with a buff ground, covered with a diaper pattern in a darker tint, which served as an excellent background for my stained and varnished furniture, and then I stained the floor *all over*, of an oak tint, forming an intermediate colour between those of the walls and furniture, and varnished it. I dispensed altogether with carpeting in the usual sense of the term, but I placed before the fireplace and fender a large rug, or rather skin, of a grey colour, and by my bedside and before the various pieces of furniture, where room could be found for them, some Indian rugs and pieces of Chinese matting, which gave the room the colour that was necessary to impart a desirable tone to the whole.

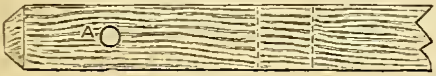


FIG. 54.—PLAN OF SIDE-PIECE AT HEAD.

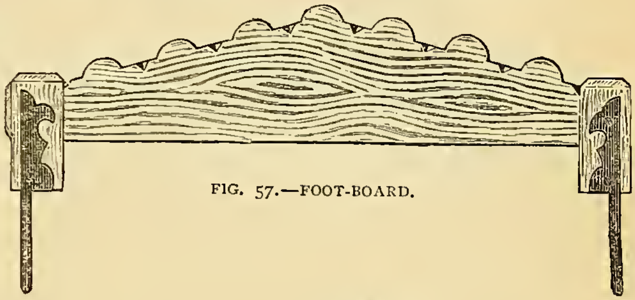


FIG. 57.—FOOT-BOARD.

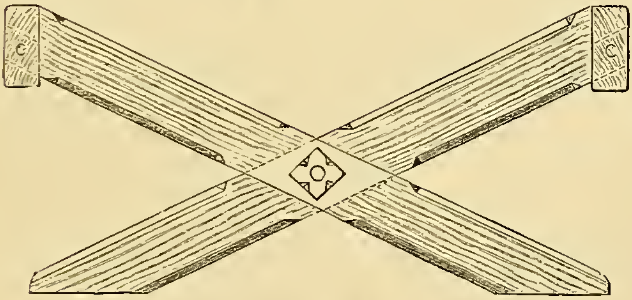


FIG. 55.—LEGS OF BEDSTEAD.

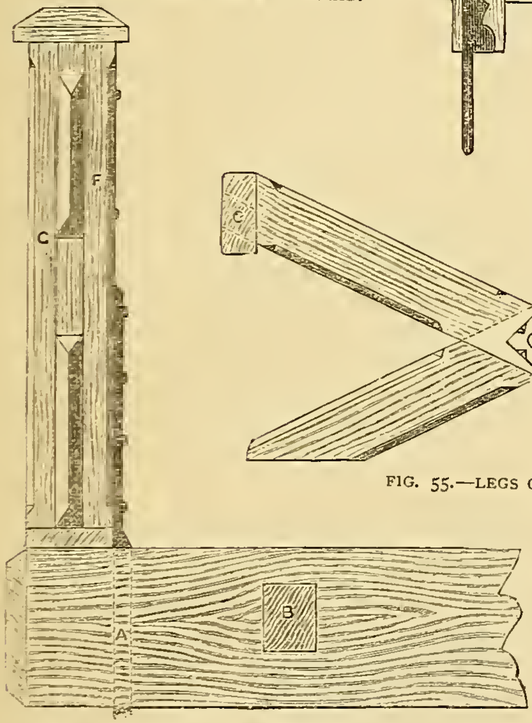


FIG. 52.—SIDE ELEVATION OF BEDSTEAD AT HEAD.

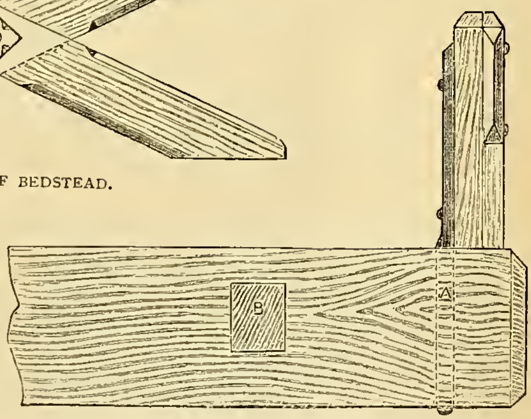


FIG. 53.—SIDE ELEVATION OF BEDSTEAD AT FOOT.

The general effect was so artistic and so highly satisfactory that it made me fairly hungry to achieve even greater things in furniture making, and to deal with other parts of my house in succession. What I made I hope to have the privilege of describing in future pages of AMATEUR WORK. I have fully pictured by illustrations and words every thing that I made and did to render my bedroom habitable, and I am sure that no one who may undertake a similar labour will ever regret that he was induced to take the work in hand. I venture to hope that my suggestions will prove practically useful, not only to readers at home, but to readers in our Colonies and dependencies also, into whose hands I find, from addresses, etc., in "Amateurs in Council," this Magazine finds its way, and to whom it seems to be peculiarly acceptable.

Conclusion of PART I.

LITHOGRAPHY FOR AMATEURS.

By H. E. GRANTHAM.

VI.—COLOUR PRINTING.

IN the preceding chapters I have treated of the printing in black only. In this chapter I will endeavour to explain the way to prepare *dry* colours for printing. Colours are unlike black inks in that it is not generally wise to keep them ready ground, as they are very apt to skin over, and do not work nicely afterwards, because the skin mixes with the ink and forms little bits which won't mix with the varnish, and consequently have to be picked out.

The following additional tools will be required:—1 marble muller for grinding ink; 1 marble ink slab, or one made of a thin litho stone, but marble is best; 1 colour roller (I consider the Lanham Patent Victory Roller to be the best suited for amateur use); and a small assortment of dry colours the printer thinks of working in.

The roller will cost about 15s., if it is what is known as an 11 inch roller; the other things cost but little, as the inks go a long way when in powder, and a quarter of a pound would be quite enough of most colours, except, perhaps, vermilion, which is a very heavy colour, and a much greater weight must be got than of the others, to be in proportion in regard to bulk.

The ink slab, muller, palette-knife, etc., must be quite clean before starting, or it is certain to spoil the pure "clean" appearance of the colour, and only clean varnish should be used. The colours can be kept in bottles, corked to keep out the dust.

To Prepare the Colour.—Place everything handy, and see all is clean. Put about a teaspoonful of colour on the slab, and also some "strong litho varnish," and mix them together with the palette-knife. It should be so stiff that the knife can scarcely work them at all. *The stiffer the ink is mixed, the better and smoother it will grind.* Spread the ink on the slab, and take the muller in both hands, and using the *edge*, not the *flat* bottom of the muller, push it from you, using plenty of pressure. The muller will gradually spread the ink over the slab as it works backwards and forwards, and the colour and varnish are gradually worked into a creamy mass through which the muller forces its way with some difficulty. The grinding must be continued until, on gathering up the ink with the knife, it looks quite smooth and free from any gritty appearance when spread out with the knife. The "pat" is now thinned to a working consistency by middle and thin litho varnish, as required. Colours generally require to be rather thinner than black ink.

It is a good plan to file a portion of the rim of the bottom edge of the muller, so as to get a longer bearing surface to grind the ink with; the one I use is shaped like A and B in Fig. 8, in section and plan.

The work for colour printing is always rolled up in black, cleaned and etched, and a pull or two taken off to ascertain if all is right, in such small details, as show most strongly in black; the actual printing is precisely similar to black work, except that it is more difficult to keep the colour full and even, not only because there is less "body" of colour in colours, but because the ink stiffens on the roller much faster than black ink does, and it is also apt to get dirty, for which reason use a clean damping cloth if possible. Some colours dry very fast, especially if they have flake or drop white in them, and require frequent thinning with thin varnish, but as this is liable to be overdone, so that there is no longer enough "body" to print to the proper colour, considerable caution must be used as to how often the ink is thinned.

Colour printing is more apt to clog up the work than black. If plain water is not sufficient to keep it clean, add a little stale beer, or strong salt water to the damping sponge. Either is good, and will keep the stone damp longer than water alone, but both have a tendency to etch the fine lines away, and therefore require great care in using.

To Print in Gold or Silver.—Gold leaf is very rarely used by even the highest of professional printers, gold bronze answering every purpose. The bronze is sold at so much per pound, and is put up in 1 oz. packets. A very good quality can be obtained at 1s. 6d. an ounce, a quantity that will last for several hundred 8vo sheets of note-paper or cards, unless the work is exceptionally solid and heavy. The work is printed with a dark brown ink, similar to burnt umber, a few drops of gold size being added to hold the bronze better. Print fairly full, allow a few seconds for the damp from the stone to dry, then lay the printed sheet on a clean piece of paper, face upwards. A hare's foot is now dipped lightly into the bronze, and with a light hand the charged foot is rubbed over the work backwards and forwards. The bronze will stick to every part of the printed matter, even the finest lines. Brush off with the foot the superfluous bronze, and then rub the work lightly and briskly till the gold looks as bright and smooth as the nature of the paper will allow it to appear.

A small quantity of the bronze will still be left on the surface of the paper, and is usually left on until the following day, when the whole job is dusted at once, every sheet being dusted on both sides. A silk handkerchief is said to be best, but it does not suit me personally; I generally use a piece of "leno muslin" which has been washed to get the starch out.

To see if the bronzed work is correct, a sheet or two can be dusted directly after being bronzed, with camel hair brush used lightly and carefully.

Bronzing is a very dusty job at the best, as the bronze flies about in a very nasty manner, but the cheapness of the material and the ease of working, together with the great variety of colour obtainable by using different-coloured bronzes, make its use almost universal, except for the very highest class work, and even then the use of gold-leaf is rare. The final dusting of gold or silver work is generally left till the next day, to allow the ink time to harden. The printing for silver is usually executed in *white* ink, but most others will go well over the brown.

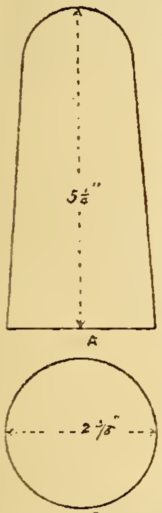


FIG. 8.—MARBLE MULLER FOR GRINDING INK. A, Vertical Section; B, Plan.

To Print in more Colours than One, the printer requires as many stones as there are colours to print. The whole job is put on a stone first, and what are called "set-off sheets" are printed from this "key-stone." The guide lines on the key-stone are ruled in litho writing ink, as fine as possible, and the sheets are not laid *to* but clean *over* them, so that the guide lines print off on them. At least one set-off sheet for each colour will be wanted. The fresh sheets are laid face downwards on their respective stones, and each stone is run through *once* with a good pressure; a set-off on each stone is thus obtained, and the first thing to do is to mark the set-off guide lines permanently, either with ink or the ordinary lead. It will be evident that if a sheet is laid to each stone in succession *exactly* to the marks, that the work will come exactly upon the same place on the paper. These set-offs on the separate stones are simply to guide the draughtsman in working up his design, of which the key-stone is the outline. He decides what portion or portions of the work will be in red, for instance, and every little bit of that colour is carefully worked on that stone, the set-off from the key-stone giving the exact position. This process has to be done as a rule for *each* colour, though a green can be got by working the same bits on a stone you intend to print in yellow, as you do on the stone you print in blue. A purple can be got by doubling parts of a crimson stone, and putting the same bits on the blue stone. A great variety of tones and colours are got this way, it saves a number of stones, and consequently the number of printings required to complete the job. These stones, after the draughtsman has completed his work, require to be gummed over, and great care is necessary in the rolling up, for the new work must be perfectly solid and firm, and at the same time every trace of the set-off, except the guide lines, which the artist should have ruled either in ink or the lead, must be got rid of. This can generally be done by a careful use of the acid and gently rubbing the work with the finger; what will not thus come off must be taken out with the snake-stone or scraper as required. When each stone is properly rolled up, and cleaned, the printer can try a few impressions in black off the stones, to try if the register is correct, leaving the key-stone till last. Every colour should fall into its place, and give the complete design in black. If this is satisfactory it can be tried in colours, taking care to print in the proper order, gold or silver first, then yellows, blues, reds, etc., and finally black. Most bronze colours can be printed in the dark brown ink previously named; but silver ought to be printed with white ink, or white with a little yellow added to enable the printer to see if it is printed full enough.

In register work the finer the guide lines the better the printer's chance of getting correct "register," as the work must be laid literally to a hair's breadth if the printer is to get the colours to fall into their proper places.

(*To be continued.*)

HOW TO CONSTRUCT A SIX-INCH WOODEN LATHE.

By OLLA PODRIDA.

III.—ALTERNATIVE FORM OF HEADSTOCK—GROOVED SPEED PULLEY FOR MANDREL.

ALTERNATIVE FORM OF HEAD-STOCK.—A few words on the construction of the alternative form given in Figs. 7 and 8 (see Supplement) may not, at this juncture, be out of place. If this arrangement is adopted, the fitting of the mandrel becomes an easy matter. As will be seen in the front elevation, Fig. 7, there is a slight difference in the configuration of H, the front part of the head, where it is slotted or parted at A, down to the clearance hole at C, and provision made at the top for adjusting screws, B. This arrangement is for the purpose of taking up wear in the mandrel bearing, and if properly treated will be found very effective in this respect. It will also be found handy for holding the mandrel rigidly when necessary, as frequently occurs in certain classes of work.

Returning to the construction of this headstock. First mark and drill the hole forming front bearing

which is parallel, and 1 inch in diameter, as seen in Fig. 24. This hole must be drilled very carefully, a sharp bit being used and every precaution taken to ensure that it is square with the front, also that the hole is clean and true throughout. Now put the headstock together, bolting and keying it firmly in place. The tail-pin centre may now be marked, and this should be done with the assistance of the front bearing in the following manner. Fit a piece of round wood to the bearing, of sufficient length to allow of its passing through up to the back part of headstock. A piece about 10 or 12 inches in length will be sufficient. It must be made a good fit, free from shake, yet capable of being turned by hand. It may be shaped or rounded by the assistance of a smoothing plane and scraper. No sand or glass-paper must be used on it, as the grit would be very likely transferred to, and embedded in, the bearing, and have an injurious effect on it and the mandrel.

The tail-pin should be a tight fit in the wood. A greater degree of truth might, in this case, be assured by drilling the hole from both sides of the upright, the marks being carefully transferred, by squaring over, for this purpose.

The front of headstock may now be partially split with a saw, as shown at A in Fig. 7, the clearance hole at C being drilled first; the adjusting screws, at B, B, may be fitted either before or after the slit has been cut; they should be of brass, if not, then they must be well greased before being inserted. The brass thrust plate at D, Fig. 7, must be fitted after the slit has been made, and cut, or parted, with a hack-saw, or ward file, after it has been adjusted and fixed in place; the hole in this plate should be slightly larger than the bearing, say about $\frac{1}{16}$ inch, and the plate bedded fairly, so that the mandrel collar may run squarely against it. Fig. 25 gives a view of this thrust plate, and shows the disposition of the holes

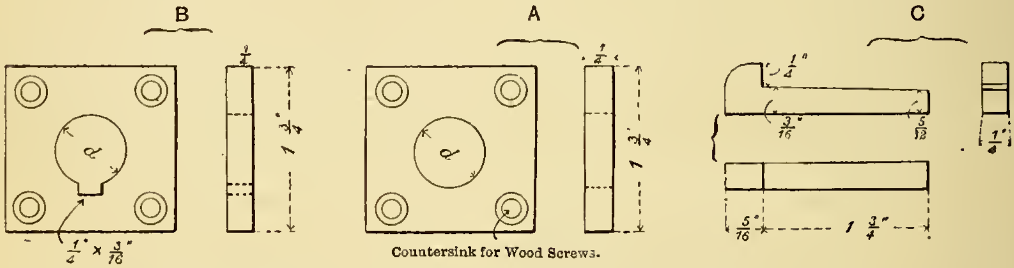


FIG. 33.—PLATES FOR PULLEY, AND KEY TO SECURE PULLEY ON MANDREL.
A, Front Plate; B, Back Plate; C, Key. A, B, and C are drawn Half Size. Note that *d* is equal to $\frac{3}{4}$ inch for Fig. 4, and to $\frac{7}{8}$ inch for Figs. 6 and 8.

Having fitted this piece of wood insert a brad, or short piece of wire in the end at some distance from the centre and sharpen it—the brad—to a point. Now pass the wood through the bearing until the scribing point of the brad, or wire, just touches the back part of headstock, and turn the wood round steadily with just sufficient lateral pressure as will cause the point to describe a fine circle upon the inside of the head. Reference to Fig. 23 will assist the foregoing instructions, and convey a clear idea of the process of marking the tail-pin centre from the front bearing.

The centre of the circle thus described will be the centre of the hole for receiving the tail-pin. This hole must now be carefully drilled to the tapping size of the tail-pin. As shown in Fig. 27, this pin is $\frac{5}{8}$ of an inch in diameter, but $\frac{1}{2}$ inch will be large enough if the latter size is more convenient. For a $\frac{5}{8}$ inch pin the tapping size will be about $\frac{1}{2}$ an inch, or a shade over, and for $\frac{1}{2}$ inch, about $\frac{3}{8}$ of an inch in diameter, so that a bit of corresponding size will be required. It will be advisable to bore and tap a trial hole first to make sure.

for wood screws. With the exception of the grooved speed pulley, this form of headstock may now be considered complete.

Fig. 24 shows the mandrel for above alternative form of headstook. Fig. 26 shows the screwed collar forming shoulder for chucks to bed against. Fig. 27 is the tail-pin, and Fig. 28 the lock nut for securing ditto. Fig. 29 gives the dimensions of the mandrel required for Fig. 4 (see Supplement), and Fig. 30 shows the lock nuts for adjusting and preventing lateral movement in this form. Fig. 31 gives, in detail, the mandrel for the alternative form of headstock shown in Fig. 6 on Supplement to this article, and Fig. 32 the bush, or bearing, required for Fig. 31. All these figures are drawn half size, and figured dimensions are added to facilitate still further an easy comprehension. As already stated, these details will be fully treated upon hereafter.

Before closing this section it should be stated that, in lubricating the bearing of mandrel in Fig, 8, blacklead and tallow, or blacklead and soft soap, should be used in preference to oil which, for metal upon wood,

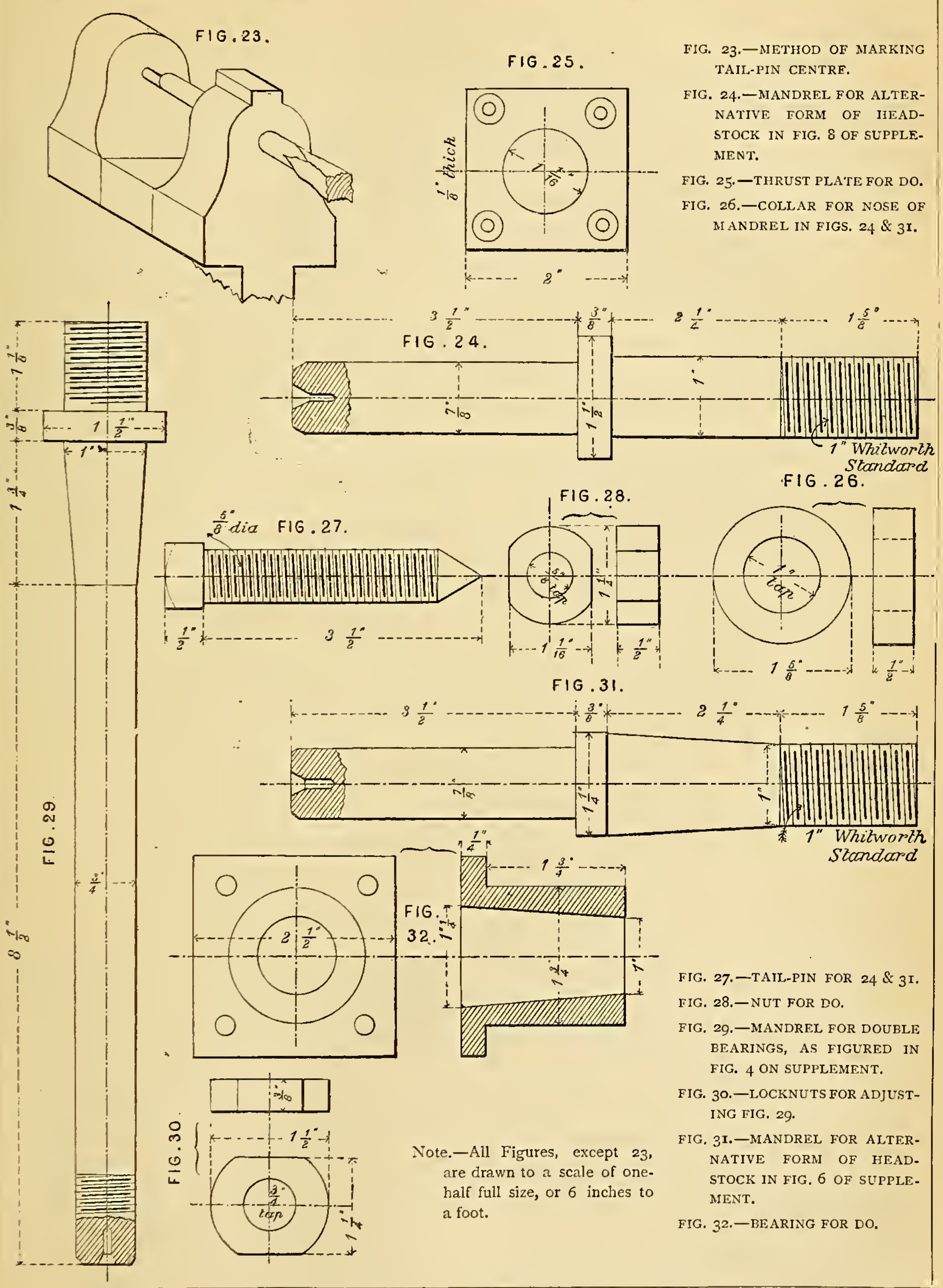


FIG. 23.—METHOD OF MARKING TAIL-PIN CENTRE.

FIG. 24.—MANDREL FOR ALTERNATIVE FORM OF HEAD-STOCK IN FIG. 8 OF SUPPLEMENT.

FIG. 25.—THRUST PLATE FOR DO.

FIG. 26.—COLLAR FOR NOSE OF MANDREL IN FIGS. 24 & 31.

FIG. 27.—TAIL-PIN FOR 24 & 31.

FIG. 28.—NUT FOR DO.

FIG. 29.—MANDREL FOR DOUBLE BEARINGS, AS FIGURED IN FIG. 4 ON SUPPLEMENT.

FIG. 30.—LOCKNUTS FOR ADJUSTING FIG. 29.

FIG. 31.—MANDREL FOR ALTERNATIVE FORM OF HEAD-STOCK IN FIG. 6 OF SUPPLEMENT.

FIG. 32.—BEARING FOR DO.

Note.—All Figures, except 23, are drawn to a scale of one-half full size, or 6 inches to a foot.

forms but an indifferent medium wherewith friction may be reduced.

Grooved Speed Pulley for Mandrel.—It may, to some, seem premature that this part should be treated upon before the flywheel has been built, but seeing that it forms part and parcel of the headstocks, it will be as well to finish them off complete before taking up another division.

A good idea of this pulley may be obtained from Fig. 4, where a section of it is shown in place. The dimensions of the pulley are common to the alternative forms of headstocks, except in the bore. It must be turned out of a block of sound hard wood, and bored or arranged in form so that the grain of the wood runs at right angles to the axis. It may be of brass or iron, if procurable, at the option of the builder, but wood is quite as serviceable as metal, provided that the timber is well seasoned and free from cracks. Oak, or mahogany would be best if get-at-able. A block $6\frac{1}{2}$ inches in diameter, and $3\frac{1}{4}$ inches thick in the rough, will be required.

Let us first consider how this pulley is to be made. It should be turned ; a handy man might fashion a serviceable one without the assistance of a lathe, but it would obviously be at the cost of much time and trouble But there is no necessity for this, as it can be turned and finished in at least two ways. Of these the first is by the assistance of a friend's lathe, and the second, by means of its own lathe. If the first case is practicable, then let it be turned upon its mandrel after being keyed in placed. The second case concerns us most, as many may lack friends—with lathes. To turn it in its own lathe, or rather, in the one under description, it must be left until the last, or until after the driving gear has been made and fixed, and the T-rest and poppit head completed.

To overcome the matter, a jury, or temporary pulley, having one speed, must be rigged up. A block of wood, about 4 inches in diameter and 2 or 3 inches thick, will serve for this. It must be roughed out to a circular form, and bored to fit the mandrel very tightly, and a groove cut for the reception of the cord. This grooving may be done with a knife, or chisel, and a rasp. Drive the pulley on and put the mandrel in place ; if either of the alternative forms in Figs. 6 and 8 are adopted, the front part of headstock must be removed, so that the mandrel may be shipped. If the form given in Fig. 4 is adopted, the mandrel may be passed through the front bearing, and the pulley put on between the sides of the headstock. The temporary pulley being in place, we are now in a position to turn the cone pulley, and also a great many other things if desired.

To prepare the proper cone pulley, it must first be bored, then placed on a wooden arbor, or mandrel—turned for the purpose—and the sides faced up between the lathe centres. The finished thickness of the pulley will be 3 inches.

In speaking of the turning of this pulley in its own lathe, it is assumed that a prong chuck, or running centre, has been obtained and fitted. The pulley might be turned without the assistance of a chuck, but as chucks will be required sooner or later, they may as well be obtained or provided at first. With regard to useful chucks in simple forms, I cannot do better than refer the reader to Vol. III., p. 116, where he will find most of his requirements anticipated.

After the blank for the pulley has been faced up, the plates must be let into each side, care being taken that they are thus let in fair with the bore of the pulley. These plates are shown at A and B, in Fig. 33. A, is the front plate fitted on the large side of the pulley, and B, the back one, fitted on the small side of the pulley. It will be seen that B has a small key way, or notch, cut in the eye. This is for the reception of a key to secure it firmly on the mandrel, which should have a flat, equal to the key in width, filed upon it. The key is shown at C, and, as will be seen, is provided with a gib or head, to enable it to be withdrawn if necessary. After this plate has been fitted, a slot must be cut in the pulley to clear the key.

After the plates have been fitted and screwed in place, the blank must be replaced on the wooden mandrel, and turned, grooved, and finished off. The temporary pulley may then be removed, and the pulley proper fixed permanently on the lathe mandrel.

The construction of the flywheel and driving gear will form the subject of the next chapter.

(*To be continued.*)

HANDY WORK IN FARM AND GARDEN.

By GEORGE EDWINSON.

IX.—GATHERING IN AND GARNERING THE FRUITS OF THE EARTH.

To the farmer and gardener of all grades, this time of the year is at once the most interesting and anxious. Crops are ripening and are getting into fit condition to be gathered in. Much depends upon the state of the weather, much upon the help available when the weather is propitious, much upon the condition of the crops when all these are in harmony, and last, but not least, the state of the store house demands serious consideration and preparation. In most parts of England all crops, except fruit, may be stored out of doors all through the winter. Corn and hay are put up into ricks or stacks, and thatched as directed in my last paper. Mangold wurtzel,

turnips, carrots, potatoes, and parsnips may also be put into cold dry pits near a sheltering hedge, and securely thatched until wanted.

Storing Apples.—But apples and pears must be stored under cover in a house, and special precautions must be adopted to ensure mellow sound fruit, free from rot. The first consideration must be, of course, to be sure that the fruit is sound and dry when gathered, and that it be plucked from the trees by careful hands, avoiding all treatment at all likely to bruise the fruit in any part whilst being plucked, carried to the store, and stowed away. Next, we must consider the position and arrangement of the storehouse. The best position for an apple store is that of a loft over a granary or other store, with its roof shaded by trees from the direct rays of the sun. To ensure perfect coolness, dryness, and ventilation, the windows of the loft should be fitted with movable weather boards, and these should be always open by day in dry weather, but closed in damp weather, and padded with straw during severe frost. Apples and pears should be stowed away on shallow trays with lattice or wicker-work bottoms. These bottoms should be covered with a thin layer of wheaten straw or reed, and the fruit set singly stem downward in a close even layer over the tray. The trays should rest on transverse supports in racks ranged in rows throughout the loft, with passages between them wide enough to admit one person at a time. When thus stored, the fruit can be kept perfectly ventilated and cool, each tray can be easily examined at any time for unsound fruit, and each sort readily marked and kept apart. The trays may be conveniently made of the following dimensions: Length, 3 feet; width, 2 feet; depth, 3 inches. The bottoms should be lattice or wicker-work, with a 1 inch mesh. The trays should be supported in frames 6 feet, 9 feet, or 12 feet long by 2 feet wide, and 6 feet in height. Those frames should be divided into 3 feet lengths by upright supports for the trays, and the transverse supports should be placed at distances of 6 inches apart, the lowest tray being placed at least 6 inches above the floor. This would allow for five trays in each division of 3 feet. The total length of frames and supports will, of course, exceed 6 feet, 9 feet, or 12 feet respectively, as we have to take the thickness of the woodwork of the frame into consideration. This may be made of 2-inch yellow or red deal quartering throughout, as shown in Fig. 108.

Storing Corn.—Directions for storing corn may be deemed by some persons to be out of place in these days of steam engine progress, when farmers have their corn threshed out in the harvest field by portable engines and threshers, which not only thresh, but also winnow the corn and put it into sacks. Farmers who thus deal with their grain do not, as a rule, pay much attention to stack-yards. The corn is put up in temporary stacks in the field, the straw is stacked in the same field after the grain has been threshed out, and the grain itself is sent to market within a short time after being put up into sacks. All this is foreign usage to the old West of England tenant farmer, who believes, and that rightly, in storing his grain in a well-appointed stack-yard until it has hardened, and until the markets are favourable to himself. Then he removes the stack piece-meal to his barn, threshes and winnows, and sacks his corn for sale to the miller or merchant. I deplore the present hand-to-mouth system of farming, with its spasmodic spurts of energy alternating with long periods of depression. Small farms, well tilled by their holders or proprietors, will yield more to the nation's wealth, and ensure more solid comfort to the greater number of its people, than large estates half neglected, as so many are at the present day. The owners or holders of large estates appear to be possessed with the idea that they must make haste to get rich, and thus outshine their neighbours, and with this idea they cultivate their holdings, putting as little energy as possible into the land, and dragging the last trace of fertility out of it. I look hopefully forward to the time when it will be possible for many peasant proprietors to hold and till the soil of England, when there shall be a waning desire to appear rich, and an increasing desire for real home comforts on the farm and in the cottage. Then these lessons on "Handy Work in Farm and Garden" will be found useful, and the back numbers of AMATEUR WORK be in demand.

The Stack-yard.—In planning a farm-yard, some consideration should be given to the position of the stack-yard. It should be at the rear and to north of the cattle-sheds and stables, and on higher ground than these, close to the barn and granary, open to the full influence of sun and wind, and well fenced. Its size must depend upon the size of the farm and the probable quantity of arable land thereon. It should be of rectangular form, and should contain two or more rectangular stands or steads. Round stands have a picturesque appearance, and the stacks built thereon are exposed to the full influences of sun and wind, but they take up more space than those of rectangular form. Another advantage in favour of the rectangular form is obtained when it is desired to thresh out the corn in small quantities. Then, a slice, so to speak, can be taken from the rectangular stack without exposing all of the roof, and the remaining part can be secured against wet weather. In building a stand or stead, we have to consider its probable demands as to strength and size, its position, and its

exposure to the attacks of rats and other vermin. The next consideration should be paid to the floor of the yard. This is often neglected, and little or nothing done to the plot of land set apart for the stack-yard, beside erecting the stands, and spreading some stones between the stands to form roads. In harvest time many gallons of grain fall from the corn as it is being transferred from the waggon to the stack, and is lost between the stones of the road or buried in the soil beneath the stand. On well-stocked farms the poultry pick up the spilt grain, to the best of their ability, but much then remains, to sprout and grow and coax vermin. The stack-yard shown on the annexed plan, Fig. 109, will give some idea of the general arrangements in such yards. The dimensions are 125 ft. by 86 ft., and it is intended to build four stands, each 40 ft. by 15 ft., to have spaces of 15 ft. between the ends of the stands, and between these and the fences, and to have three roadways, two of them 18 feet, and one—nearest the barn—20 feet in width. The top soil should be first removed, as in making a road, and the surface levelled. Then the spaces for the stands should be marked out, and the stands built. The legs or supports for the stands are usually pillars of brickwork, stonework, or whole stones of granite, slate, or freestone, or, in some instances, pillars of wood well pickled in creosote or tar. When pillars of stone or of wood are used, they should have a broad base or foot, and be inserted in the ground to the depth of two feet as gate-posts are inserted. Pillars of brick or stonework should be built on a bed of concrete, and it will be well to extend the bed under every part of the stand, and finish it off smooth as directed for paths. A floor should be thus prepared under every corn-stack, extending three feet on each side beyond the stand to the roadways. Each pillar, whether of stone, brick, or wood, should be smooth and taper, and be capped with a large stone overhanging the top of the pillar some 8 or 10 inches all around. This device is intended to prevent rats and mice from climbing up the pillars into the corn, which they would certainly do if the tops were not thus protected. At Figs. 110 to 112, I have shown sections of pillars and their caps. Slate caps are fitted to the heads of their pillars in the form of a collar and secured thereto by cement. Pillars for stands may be made from 2 to 3 ft. in height, and they are set 6 feet apart, in two or three rows. Across the tops of the pillars transversely, are laid straight wooden beams from 10 inches to 1 foot square, and 15 feet in length, and these are secured to each other longitudinally by two stout wooden rails 6 inches square, bolted to the beams at the ends, and another third row of rails along the middle of the stand. These are made to project over the end beams, and the ends are then secured by a transverse rail forming the frame of the stand. To complete the structure, a number of poles are laid across from beam to beam, and over these are spread boughs of brushwood to form the floor of the stack. Cornish farmers designate such a stand a "mow-stead," and in that county stacks of corn are named "mows." Steads or stands thus erected will last a lifetime with moderate care.

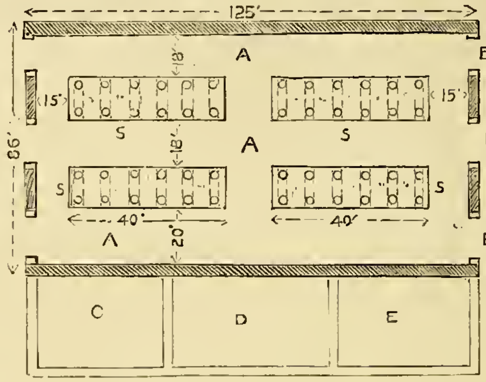


FIG. 109.—PLAN OF STACKYARD, ETC., FOR FARM.
A, A, A, Roadways through Yard; B, B, B, Gateways; C, Straw Shed; D, Barn; E, Engine Shed with Loft over; S, S, S, S, Stands.

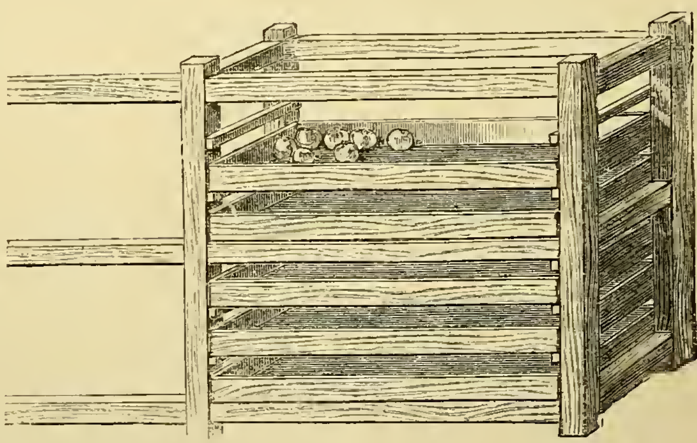


FIG. 108.—FRAME FITTED WITH PORTABLE TRAYS FOR STORING APPLES.

The roadways between the stacks are usually formed of stone, well rolled down or macadamized, but it would be an improvement to have them paved with blocks of wood set on end, and, better still (if cost is not an object) than stone or wood pavement,

would be a perfect floor of asphalte on a bed of concrete covering the whole stack-yard.

Corn put up on such stands, erected in a dry, airy stack-yard, will come into condition for threshing much sooner than it would if put up in ricks on the ground in a sheltered yard. If the stacks are well thatched as soon as they have settled, and before they have taken wet, the farmer may reckon upon firm bright grain from his store at any time during the winter. In fickle summers the newly-erected stacks cause farmers much anxiety, and it is well to be provided with rick cloths or tarpaulins to cover the stacks temporarily, to guard against a storm of rain. I cannot here stay to describe how to make rick cloths at home on the farms, but I will endeavour to do so in a future paper. During such summers, too, it is difficult to catch the corn in proper condition for carrying to the stack, and it is well to be prepared with a plan for conditioning it in the field. This is done in Devon and Cornwall by taking advantage of a moderately fine day to get the corn put up in "arish" stacks, or mows. That is to say, as the corn is being cut, it is tied up into sheaves, and these sheaves are set up in the form of small tents named "shocks." In this position, with the heads or ears of corn high and dry, the ear ends of the sheaves soon get dry enough for stacking, with only an hour or two of sunshine on them, even whilst the stubble ends are damp with recent rain. Advantage is taken of brief intervals of sunshine, to capsize a few shocks of corn, expose the stubble ends of these to the sun, and then build them up into arish stacks on the spot in the following manner: A hollow cone of sheaves with ear ends uppermost is first formed, and this is increased by pitching rings of sheaves around the corn in the same manner until it has been enlarged to a diameter of several feet, and the slope has been much diminished. Then the workman sets his right leg against the stubble end of each sheaf as he lays it on the cone, and thus forms a ring with their stubble ends partly above ground; on this he lays another ring, again setting his right leg against the ends of the sheaves, and thus he builds up a small circular stack of corn in the field, with all the ear ends inward, and forming the point of the cone. At the height of 5 feet he ceases to lay the sheaves in this manner, and gradually reduces the circumference of each ring until a very taper cone has been formed. This cone is thatched with a few wads of old reed, secured by spears and bands of reed, and tied to a point at the top. Corn thus put up may be safely carried to the stack-yard during the bright dry days of late autumn, and, if properly done, the grain will be equal in brightness to that newly cut in bright weather. To ensure success, some promptitude and energy, backed up with abundant assistance from willing hands, is necessary.

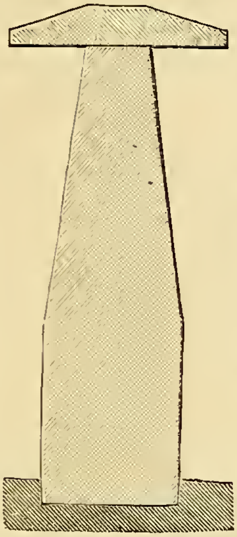


FIG. 110.—GRANITE OR WOOD PILLAR—SECTION.

FIG. 111. —SLATE PILLAR AND COLLAR—SECTION.

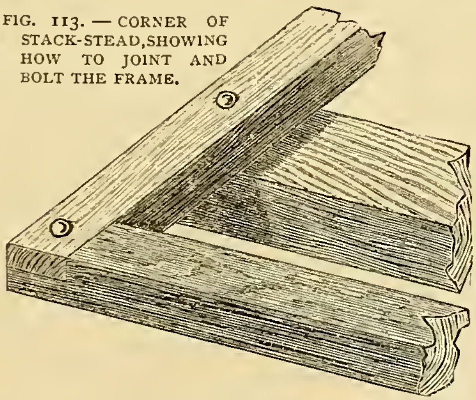


FIG. 113. — CORNER OF STACK-STEAD, SHOWING HOW TO JOINT AND BOLT THE FRAME.

FIG. 112.—BRICK PILLAR CAPPED WITH STONE—SECTION.

In the preceding paper, I have briefly shown how grain is threshed and the straw is combed. I cannot stay here to describe the whole process of threshing, winnowing, and clearing all kinds of grain, as this varies with wheat, barley, and oats, and would take up much space to properly describe. I will, therefore, only

say that the grain, when winnowed and freed from chaff and other foreign substances, is put up into sacks for the market, or stowed away in bins erected in a granary. Few farmers go to the expense of erecting and fitting up a granary. On some farms may be seen a special form of this structure erected on pillars, to prevent incursions of vermin, and fitted up with bins for the various kinds of grain. On other farms a spacious loft, well floored and fitted up with bins, is constructed over the engine-house and root-house at the end of the barn. This arrangement has points of advantage which recommend it for general adoption. A loft thus provided, and furnished with a door communicating with the barn for the reception of grain, may be used as a granary and mill combined, fitted with mills for crushing oats, barley, and other grain for the stock, and supplied with power from the engine below. Even when horse or water power is used for threshing the corn, the same may be applied, when needed, to drive the mills.

Storing Potatoes and other Roots.—On well-appointed farms provision is made for storing roots in long, narrow sheds, near the stack-yard, and, in addition to these, a special root-house is provided wherein the roots can be prepared for the market, or cut up for the cattle. In the root-house is located the turnip-cutting machine and chaff-cutter, placed thus close to the engine or other source of motive power. The house should be well lighted, to enable the workpeople to sort and examine the roots for market. It should be near the stores of roots if possible, or communicating with them by covered ways, in order that the roots may be conveyed to it dry in wet weather. If sheds are provided for the storage of roots, the following precautions must be taken to prevent rot:—The sheds must be on dry, well-drained ground, and the floor should be elevated above the surrounding ground; they must be well thatched or otherwise roofed, and the rain water carried away from the sides of the sheds. They should be either narrow, from 10 to 12 feet in width, or divided by passages to ensure proper ventilation and prevent heating and fermentation. Roots, such as mangolds and turnips, are apt to become heated when thrown together in large masses; bruised parts then ferment and rot, uninjured roots sprout, and the whole stores are soon reduced in value. Although well ventilated, the root-sheds must be proof against hard frosts. Ventilators can then be stopped with straw, but all windows and doors must be constructed to close and exclude frost. Store sheds for mangolds, turnips, and similar roots should have doors wide enough to admit a cart, in order that the cart may be backed into the shed and its contents tipped.

Where sheds have not been provided, and storage room cannot be spared in the farm buildings, some other safe means of storage must be adopted. Roots can be well and safely stored in the field by means of "caves" properly constructed. The site chosen for a "cave" should be on high and dry ground. If it can be protected from storms by a high stone or composite hedge, this site should be chosen, provided it is in a dry situation. To prepare a "cave" for any kind of roots, first remove the top soil to the depth of 6 inches over a space 6 feet in width and to any length required, and beat the floor of the "cave" hard with a shovel. Cast the loose soil up into a ridge on each side, if in the open field, or on one side if by a hedge. Now make up some long thin faggots of fine brush-wood or hedge-parings, and lay them along on each side of the excavation to prevent the roots from touching the soil at the sides. Over these, as the roots are being built up, spread a layer of straw, and thus prevent frost from entering the cave at the sides. The dry roots are to be carted or carried to the site of the cave, and built up into a sloping pile or heap within the excavation. The whole pile of roots must then be covered with straw or dry stubble, and thatched in a similar manner to that of a rick or stack of corn. The directions already given for thatching will apply to this work also, but special care must be taken to have large eaves-wads well secured to the brushwood faggots, and the thatcher must see that no hole is left by which the frost or rain can enter. When the cave is thatched, it should be further protected from frost by a layer of earth covering closely all the thatch. To do this, dig a trench along by the outside edge of the cave, and throw the soil, removed from this trench, up on the thatch in an equal layer of from 1 to 1½ inch in thickness; press the soil down firm, and give it a smooth surface with the back of the shovel. The trench should be from 15 to 18 inches in depth, and of similar width. In all cases, the bottom of the trench should be carried to a level below the bottom of the cave, and should be carried along the sides and around the ends to form a drain. The slope of earth should be carried up from the bottom of this trench to the ridge of the cave. It may be thought by some persons that thatch thus covered with soil would retain moisture and become rotten, but experience demonstrates to the contrary, as the rain appears to trickle down under the soil over the thatch and the whole soon dries again in dry weather.

All roots and fruit should be garnered in dry weather. If packed away in a damp condition, heating, sweating, and rot will follow as a consequence. Potatoes should be sorted in the field, all diseased and injured tubers should be rejected, the sound roots only be carried in baskets to the cave, or put up in

bags for conveyance to the farm. Mangolds should be topped and all leaves remove ; surplus soil should be removed from the roots, but care should be taken not to bruise or cut the bulbs. Swede turnips will stand more rough usage, and may be closely trimmed with a chopper before they are carted to the cave.

Caves should be opened in dry weather only, and care should be taken to cover the opening securely at nigbt to keep out all frost. If these instructions are carefully followed, roots may be securely stored in the fields all through the winter, however inclement the weather may be.

(*To be continued.*)

MOUNT-CUTTING; AND ALL ABOUT IT.

By AN OLD HAND.

I.—TOOLS AND MATERIALS—HOW TO CUT MOUNTS—VARIOUS FORMS FOR MOUNTS—SPACES FOR INSCRIPTIONS.

AS I have noticed applications in "Amateurs in Council" from many readers of this Magazine for instructions in Mount-Cutting, and as I have been accustomed for some time to do work of this kind for myself, I will endeavour, to the best of my ability, to satisfy all those who wish to gain some knowledge of the process itself, by a descripton of the tools and appliances that are required for it, and the manner in which it is carried out. Firstly, for Mount-Cutting, we require a good knife, blade being from 6 inches to 8 inches long, and shaped like an arrow, as shown in Fig. 1, both edges and point being sharp and smooth from the oilstone, as also a hand with screw, by which to regulate tbe blade or effect its release for sharpening. A bandle is not absolutely necessary, as we can take two small slips of wood, and bind them one on each side of the blade, which answers all the purpose of a handle admirably. The blade can be bought at any tool-maker's for from 8d. to 1s. each. The rest of the appliances that are required are an iron rule, a set square, T square, compasses, some gold ink, and prepared gold paper, and a few assorted tints, six sheets, a board—the cost of the whole being very small. The gold paper we may prepare ourselves by getting a sheet of paper ready gilded, pin it down to a board, and with fine glue or good gum spread evenly over the back, and let it dry, and then cut it up to strips, $\frac{3}{16}$ to $\frac{1}{4}$ inch wide, but it can be bought ready prepared with the other things already mentioned, exclusive of square and compasses, which doubtless every amateur possesses, of Mr. Gus Rochefort, 29, *Basinghall Street*, *London*, *E.C.*, at the following prices :—

	£	s.	d.
Mount-Cutting blade . . .	0	1	0
Half-dozen assorted tinted boards .	0	2	0
Half-dozen mill boards . . .	0	0	9
Gold Paper, half sheet . . .	0	0	4
Gold Ink in bottle	0	0	8
Glue, 1 lb.	0	0	8
	£0	5	5

Having procured our cardboard, etc., we can proceed to work. Suppose, for example, we want a French grey mount for a photograph : lay the card flat on the bench, and place the photo on top, as near the centre as possible, or leaving as much margin as may be wanted, prick with a needle or pin, about $\frac{1}{8}$ inch within the photo at the four corners, as in Fig. 2, then with the set square, pencil a square, taking the pin holes as a guide to the size of the picture, and lay the iron rule to left of pencil line, and with the right hand hold firmly in your fist the knife with point of blade protruding under the little finger, press firmly with the left hand on the rule, and insert the point of knife near one of the corners, top right hand, and draw it towards the body. As I said before, keep the rule firmly pressed on your work, the knife well in, and the knuckle of the little finger pressed on the cutting board or bench. In this way, cut each side; should any corner remain uncut, it is easily trimmed out afterwards. Again, suppose, for example, that we wish to cut a mount, having an opening of 10 inches by 8 inches, with 3 inches margin round, we take a piece of cardboard, 16 inches by 14 inches, trimmed square, and with the rule gripped at 3 inches, and with pencil in left hand, guide them round the card from the outer edge, which will give the required size, 10 inches by 8 inches ; then proceed as before stated with cutting. Next, take a piece of gold binding paper, moisten with the tongue, and stick it in the corner on the right, working from right to left, rubbing it well down as you go, so that it does not easily come off ; then if we want a fine gold line round the opening, I find that the best method of tracing it is to fasten a hard pen to one leg of compasses, and with the compasses fixed at the required width so as to get a line $\frac{1}{2}$ inch from opening. Having fixed the compasses thus, dip the pen in gold ink, and guide the leg that has no pen on it round the inner cutting of mount, pressing lightly with the pen, and just sufficient to give a fine line ; or the line may be rubbed round, by first marking the required distance with compasses, and then rubbing in the ordinary way with iron rule. When the line has been traced, lay the mount on one side to dry ; take the photograph, damp it over the back and glue it—or, what is better than glue, take

four or five pieces of white starch, place them in a clean basin, and mix smoothly with sufficient cold water to make a smooth paste, then pour boiling water over until it turns thick, and when it gets cool enough to bear your fingers in, spread evenly over the photo, pick it up, and lay it on a piece of card, lay another clean piece of paper over, and rub down from centre with cloth formed into a pad, care being taken to get no crease in it. Photographs are often mounted on cards instead of having cut mounts; they look very nice thus, and do well for putting away in a portfolio. When mounted thus, they are treated as follows: take the photograph, or scrap, or whatever you may be going to mount, and cut carefully square and neat; then select a tint to suit the photograph. I may add a tinted board for photographs looks better than a white board, as it enhances the beauty, or rather, to speak more practically, it adds strength to the high lights to have a coloured surrounding. Supposing the photo to be 10 inches by 8 inches, and that we want 4 inches margin, trim the board square, 18 inches by 16 inches, then tracing a guide line at 4 inches from outer edge, damp the photograph, and starch it thinly and smoothly, and then place it within the guide lines and rub down with blotting paper, which will take up any superfluous damp or starch, etc., etc.

FIG. 1.—KNIFE FOR MOUNT-CUTTING.

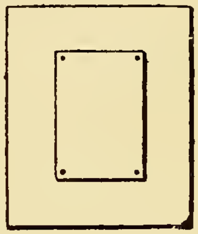
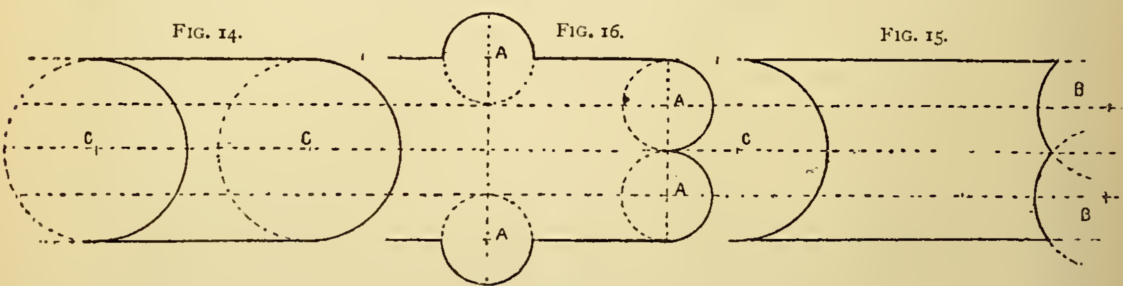


FIG. 2.—METHOD OF FORMING MOUNT FOR PHOTOGRAPH, ETC., ETC.

Having explained the mode of cutting mounts which, like all other things, requires a little practice to attain anything like perfection, we will now take a few varieties of shapes into consideration. Professional mount-cutters, as a rule, retain a variety of zinc patterns, such as ovals in all sizes, elliptic, octagonal, arch top, round, oval top, etc., which supply all required sizes. Thus, supposing a mount-cutter wishes for an oval, $11\frac{13}{16}$ inches by $9\frac{13}{16}$ inches, and has only a plate, 10 inches by 8 inches, he lays it in the centre of the cardboard, and with compasses makes up the deficiency, when the line is drawn; it is cut as explained. For amateurs, however, these plates would be an expense; and I wish to show the most economical mode of doing it, as we have many other expenses in the amateur workshop than mount-cutting. It is always best in fancy mount-cutting to cut a shape in paper first, by cutting it to the size of picture and doubling it up, and with scissors cut the required shape, which must be determined according to picture. For example, suppose we want a fancy shaped mount for a Forester's certificate, take a piece of paper, double it up, and cut it shape best fancied; or perhaps a better mode is to trace out a square on the card the size of extreme opening, then stick eight pins, one in each corner and one in each centre, tie a piece of twine to about 2 inches length, place it over each pin, and with a pencil draw a semicircle, which makes a very pretty shape, as in Fig. 3. The shape shown in Fig. 4 is obtained in the same manner, by tracing square or oblong from pin of each corner. The shape with arched head, shown in Fig. 5, is got by placing pin in square, and then with compasses you can find the exact position from which, as centre, to strike the arch, and which in this case happens to be the intersection of the dotted central lines in the direction of the length and width. The shape indicated in Fig. 6 is obtained in the same manner, by striking an arc at each end of the square or oblong.



DIAGRAMS ILLUSTRATIVE OF THE METHODS OF FORMING SPACES FOR INSCRIPTIONS FOR PICTURES BY AID OF COINS.
A, Sixpence; B, Shilling; C, Penny.

To trace the circle in Fig. 7, place pin in centre, and measure for, say, a circle $11\frac{1}{2}$ inches in diameter, $5\frac{3}{4}$ inches of twine, etc. To trace the oval or ellipse shown in Fig. 8, set out your square or oblong and the central dotted lines as shown. Then, supposing the length and width of oval required to be 8 inches by 6 inches, from the centre D in each direction to A

and B will be 4 inches, and C to G 3 inches, and then set off D E along D A, and D F along D B, each equal to D C or D G, each being 3 inches. Now stick pins in card at C, E, and F, and tie a piece of fine twine round the three as tightly as you can without pulling them out of place. Remove the pin from C, and place the point of a pencil in twine, tracing it round, keeping the twine at full stretch, and taking care the pins are secure and the twine does not slip up the pencil or pins but remains quite close to the card. When the aperture for picture in centre, trace out underneath a rectangular oblong, and then with coins—say a penny and a sixpenny piece—very neat shapes can be made, as shown in Figs. 14, 15, 16, but these are put in a reduced form to prevent waste of space.

Although I have got thus far in my instructions on Mount-cutting, I find that there is much yet to be said respecting this art, which for many reasons is peculiarly well suited to amateurs, and that I must needs defer the completion of the sub-

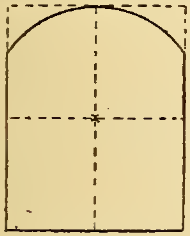


FIG. 5.

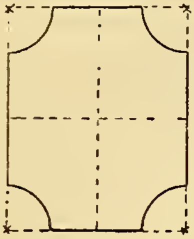


FIG. 4.

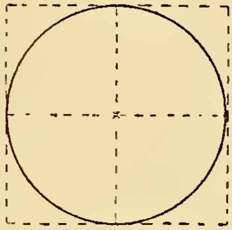


FIG. 7.

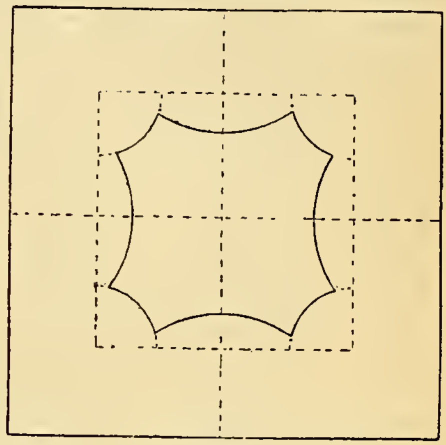


FIG. 3.

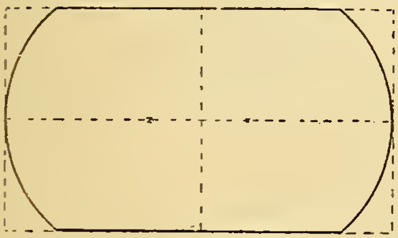


FIG. 6.

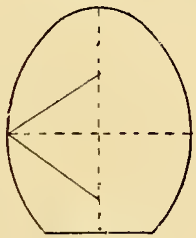


FIG. 9.

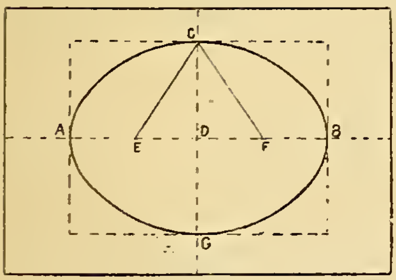


FIG. 8.

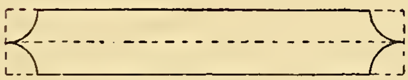


FIG. 11.

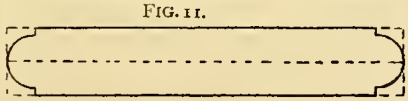


FIG. 12.

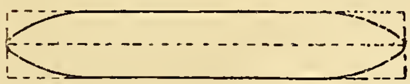


FIG. 13.

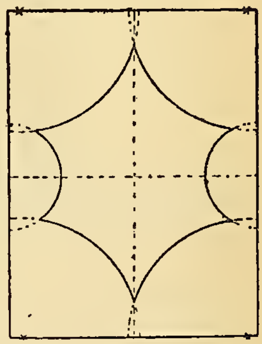


FIG. 10.

DIAGRAMS ILLUSTRATING THE FORMATION OF VARIOUS SHAPES FOR MOUNTS, SPACES FOR TITLES, ETC.

upper half of the oval is traced, bring the twine down to the lower part of the card, and trace the lower portion of the oval in the same manner. By this simple means, ovals of any size can be struck out correctly. Fig. 9 is a modification of the shape shown in Fig. 8, and Fig. 10 of the shape shown in Fig. 1. The method of tracing them will be easily understood from that which has been already said.

Openings for titles of pictures can be cut simply by cutting out patterns in paper and placing in position as required; some forms are shown in Figs. 11, 12, and 13. Spaces for inscriptions and titles may be easily done in the following manner: after cutting ject, and reserve what I have to say for another paper. It is desirable that all coloured pictures in imitation of water-colour drawings, and water-colour drawings themselves, should be thus treated; and I am inclined to think—although it is the rule and custom to frame them without mounts—that engravings would often be improved by being done up in this manner. It would certainly answer well in the case of old and soiled engravings in which it is the chief object to hide a stained margin, in which the traces of age and dirt are more perceptible than in the engraving itself.

(*To be continued.*)

HINTS ON THE UTILISATION OF WASTE MATERIALS.

By R. LEWIS.

IV.—ELLIPTICAL FRAMES—BRACKETS—PORTFOLIOS—SQUARE VASE—BOTTLE STAND—SQUARES, ETC.—KNIVES—SHELVES—THREAD WINDER—PATCHWORK GAUGES—PICTURE FRAMES—PAPER RACK—MONEY BOX.

ELLIPTICAL FRAMES (Fig. 34).—Describe a circle with a diameter equal to the longer one of the ellipse, A B. Divide this into eight equal parts; from this project a parallelogram, C D E F, equal in width to the shortest diameter of the ellipse, and draw diagonal lines, E D and C F, from the corners. From the diagonal lines, G and H, of the circle raise perpendiculars, and where they intersect those, G and H, of the parallelogram will be formed in the ellipse desired. Then bisect *a b* and *b c*, and produce the lines at right angles until they meet at D, which will be the centre of the circle; and where the end radial lines, *a* D and *c* D cross the longer diameter at *e e*, will be the centre of the end circles.

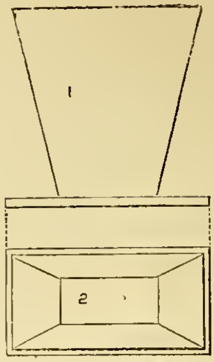
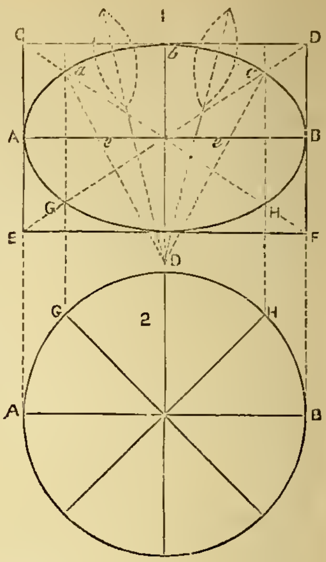


FIG. 37.—SQUARE VASE. 1, Elevation; 2, Plan.



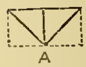


FIG. 34.—ELLIPTICAL FRAMES. 1, Elevation; 2, Plan.

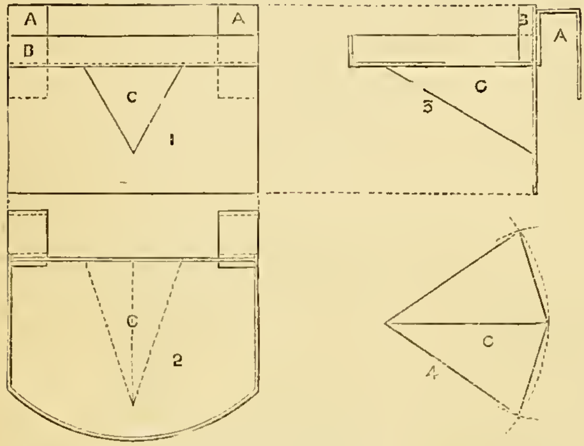


FIG. 35.—BRACKETS.
A, Tin Hooks; B, Slips to Support Tin Hooks; C, Strengthening Bracket; 1, Front Elevation; 2, Plan; 3, Side Elevation; 4, Shape of C before Bending.

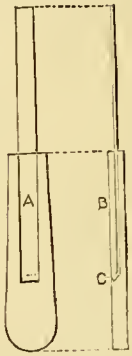


FIG. 41.—KNIVES. A, Front View; B, Side View.

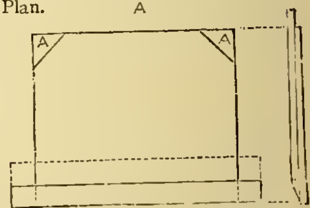


FIG. 36.—PORTFOLIO. A, Corner Pieces.

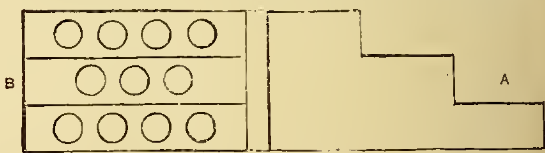


FIG. 38.—BOTTLE STAND. A, Side Elevation; B, Plan.

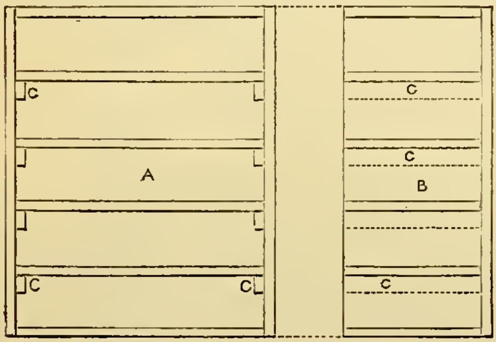
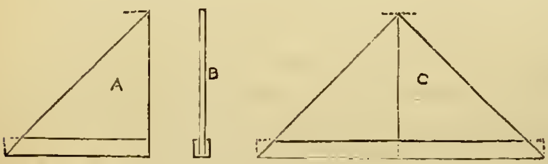


FIG. 42.—SHELVES. A, Front View; B, Side View; C, Bearings.



39.—SQUARES. A, Front View; B, Side View; C, Front View.

Brackets (Fig. 35).—For the body of the shelf proceed as directed at Fig. 15, and if it requires a stronger bracket, it may be made after the manner of half a four-sided vase, as described Fig. 14. To fix it to the piece of furniture, bend two pieces of tin, A, A, (one for either end), and on the back piece of the shelf cement two pieces of wood, B, to take the screws which are to be passed through the pieces of tin to retain them in their position.

Portfolios (Fig. 36).—Cut out the boards the required size, and draw a line about an inch from the edge, and on this part glue a piece of linen of sufficient length to allow of being turned in at each end. When one cover is dry place the other squarely on it, but overlapping the edge as much as is required for the width of the back; the linen is then glued on to this part as on the other. If the corners are required to be bound, cut rectangular pieces, A, the length of which is double the width, thus forming two squares. If the piece is folded diagonally it will be of the proper shape to fix on the corner.

Square Vase (Fig. 37).—When the sides of this vase are glued together, it will be well to rub the bottom upon a piece of glass cloth laid upon a flat board; this will give the edges a better surface for gluing on to the bottom.

Bottle Stand (Fig. 38).—This is made as a box, having two of its sides cut away as steps on which the shelves are to rest, by having the back half recessed the thickness of the sides, or they may be supported on ledges glued on for the purpose.

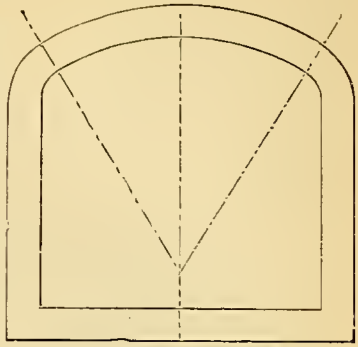


FIG. 46.—PICTURE FRAME.

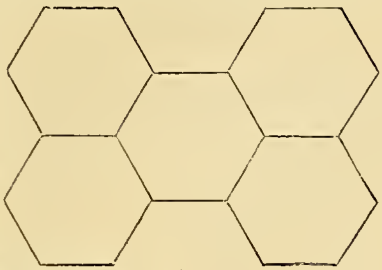


FIG. 44.—PATCHWORK GAUGE. Hexagons.

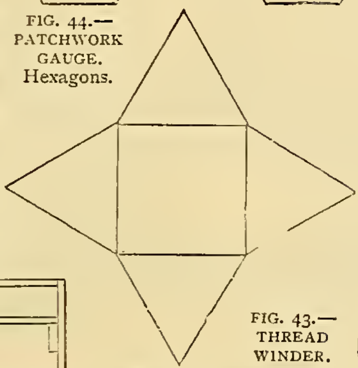


FIG. 43.—THREAD WINDER.

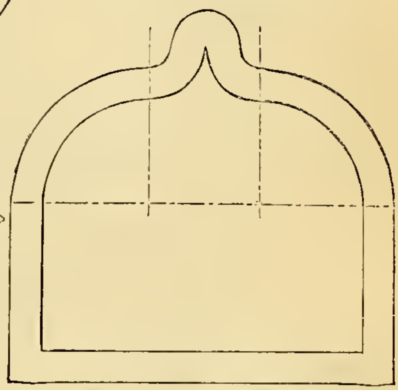


FIG. 47.—PICTURE FRAME.

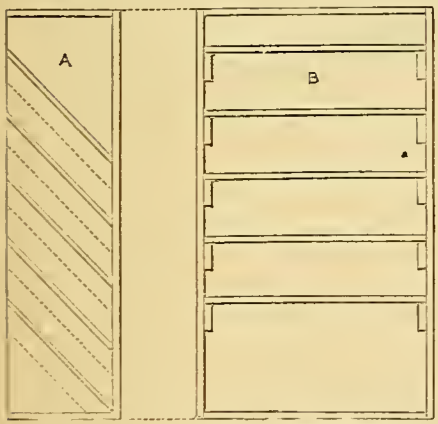


FIG. 48.—PAPER RACK. A, Side View; B, Front View.

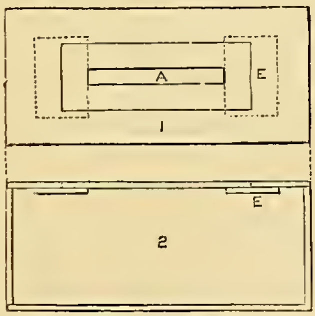


FIG. 49.—MONEY BOX. 1, Plan; 2, Elevation.

Squares, etc. (Figs. 39 and 40).—Mark out the figure by the intersection of lines, and, if required to work along the edge of a board, glue strips, as shown, on to the base line of the figure, either upon one or both sides. In Fig. 39 A shows an angle of 45° at the top corner, and C an angle of 90° at the top corner. In Fig. 40 the angles at the top corners are 60° in D, and 30° in F.

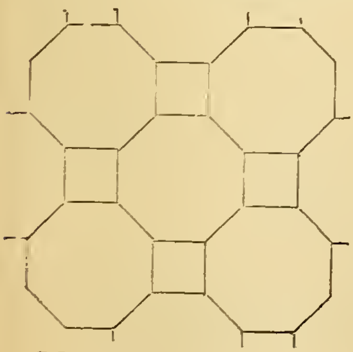


FIG. 45.—PATCHWORK GAUGE. Octagons and Squares.

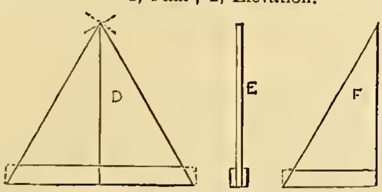


FIG. 40.—SQUARES. D, Front View; E, End View; F, Front View.

Knives (Fig. 41).—Take a piece of crinoline steel, and slightly bend a small portion of one end, as at A, so as to retain it in a groove cut in a flat piece of wood, upon which another flat piece is to be glued, and when dry the handle is to be finished.

Shelves (Fig. 42).—Make a box, and inside upon each of the two sides glue narrow strips, C C, upon which the shelves can slide.

Thread Winder (Fig. 43).—This is a square with an equilateral

triangle on each of its sides. Its utility for the purpose indicated is obvious.

Patchwork Gauges (Fig. 44).—These are hexagons which may be cut out of tin or pasteboard, and used as templates. (Fig. 45).—A combination of octagons and squares.

Picture Frames (Figs. 46 and 47).—Assemblages of the pieces shown in previous Figs.

Paper Rack (Fig. 48).—This article is similar to the nest of shelves shown in Fig. 42, with the difference that the shelves are fixed in a slanting position, the more easily to retain papers and the like.

Money Box.—Fig. 49 is a box, in the top of which is a slit, A, to receive the money, or it may be made with a parallelogram (also with a slit), and made to rest in a corresponding opening in the lid, and to rest upon two cross-pieces, F, F, in the underside thereof. This may be retained in its place by a piece of card or paper fixed on to the top with paste or sealing-wax, so that it may be easily opened when the contents are required to be withdrawn.

A GLOVE LOCKER FOR THE HALL.

By E. S. D.

THERE may be many readers of AMATEUR WORK who, like myself, live in houses in which what is dignified by the name of "the hall," is nothing more than a narrow passage, in which there is no room for a table, and consequently there is no drawer in which to keep gloves, hat-brush, etc. The want of this made me set to work to devise something which should occupy but little room, which should serve as a receptacle for gloves, etc., as well as a conspicuous place for visitors' cards and letters for post, and, lastly, which should not be unsightly. I hope that those who have felt the need of something of this kind will think that the locker, roughly sketched in Fig. 1, satisfies the requirements. I may add that it would be equally useful as a receptacle for brush and comb in a lavatory or dressing-room.

Now, as to the material of which to make the locker. This should, to a great extent, depend on the balusters or other fittings near the place where it is to hang. I have made one of pitch pine and one of mahogany, both, of course, French polished. I should say that pitch pine or walnut would be most suitable for a hall, mahogany (ebonized or not) for a dressing-room; but, of course, this is merely a matter of taste. As to the quantity required, one piece of one inch stuff, 2 feet 9 inches long, will be wanted for the frame, Fig. 2. If this piece is 6 inches wide it will be sufficient. The rest of the locker will take about $4\frac{1}{2}$ square feet of $\frac{3}{4}$ inch stuff. The cost in Spanish mahogany would not be more than 3s. 6d. or 4s., and in pitch pine would, of course, be very much less. The looking-glass would look better if bevelled, but bevelling about doubles the cost. The size of the plate is 18 inches by 14 inches, and I paid 4s. each for mine. Fig. 1 makes the construction tolerably apparent, but as some points may not be quite clear, I will endeavour to give a description.

The first part to make is the frame, Fig. 2. This is made of inch stuff—the side-pieces are 2 feet 9 inches long by $1\frac{1}{4}$ inches wide, the cross-pieces $13\frac{1}{2}$ inches long by $1\frac{1}{4}$ inches wide, but the latter must be cut 15 inches long to allow for the tenons by which the frame is mortised together; the upper mortises must be cut 3 inches from the top in each side bar, and the lower mortises in such a position that the two cross bars are $17\frac{1}{2}$ inches apart. The frame must be neatly fitted together, or the effect will be very much marred. It must not be glued together at present until the rebate has been cut for the glass behind, and the beading worked on the front surface. The rebate must be slightly over $\frac{1}{4}$ inch wide, so that the glass may just drop into its place, and it should be $\frac{5}{8}$ inch in depth. So-called inch stuff is generally about $\frac{7}{8}$ inch when planed up, so that, when the rebate is cut, $\frac{1}{4}$ inch will be left in front of the glass all round.

The next thing to do is the beading. This need only be done on the top cross bar, and on the two side bars in the upper 19 inches. The pattern is a matter of taste, but a double bead looks as neat as any. Whatever the pattern chosen, it should be done with a "scratch." If any reader who attempts ornamental cabinet work has not one in his workshop, let me advise him to make himself one without delay. The tool is described at p. 511, in Vol. II. of AMATEUR WORK. Men learn by the mistakes of others as well as by their own, so I give my experiences of the "scratch." I filed my first blades to a shape like Fig. 8, that is, with vertical sides. I found that this did not give a clean edge to the grooves; but I soon found that by bevelling the sides, as in Fig. 7, the tool cut clean, and the effect was very different. The blade should be filed up accurately, and then finished with a slip of oilstone, great care being taken to keep the edges square. If the tool is sharp no sandpapering will be wanted, except, perhaps, at the ends of each beading, where a touch may be needed with a fine file, and afterwards with fine sandpaper.

The box part of the locker had better be done next. One of the sides of this is shown in Fig. 3. Two of these must be cut out of $\frac{3}{4}$ inch stuff, care being taken to cut the groove to receive the floor of the box on the proper surface of each side-piece. These grooves need not be more than $\frac{1}{8}$ inch deep. Next, the floor and

top of the hox, Fig. 4, must be cut from $\frac{3}{4}$ inch stuff, and the top grooved to receive the two sides. The front edge, and the two ends of the top are to he "scratched," but, of course, with a smaller head than that used for the frame. The sides are now to he secured to the floor hy two screws on each side, the heads of the screws being sunk well below the surface; these screws will afterwards be hid by small turned huttons. The top had hetter not be fixed at present—in fact, it can he glued on after the whole thing is polished. The door should be cut from $\frac{3}{4}$ inch stuff now, and very carefully fitted, and then headed with the "scratch" about $\frac{7}{8}$ inch from the upper and lower edges, the larger bead heing used. The small brass drop handle shown in Fig. 11, which can be bought at almost any cabinetmaker's

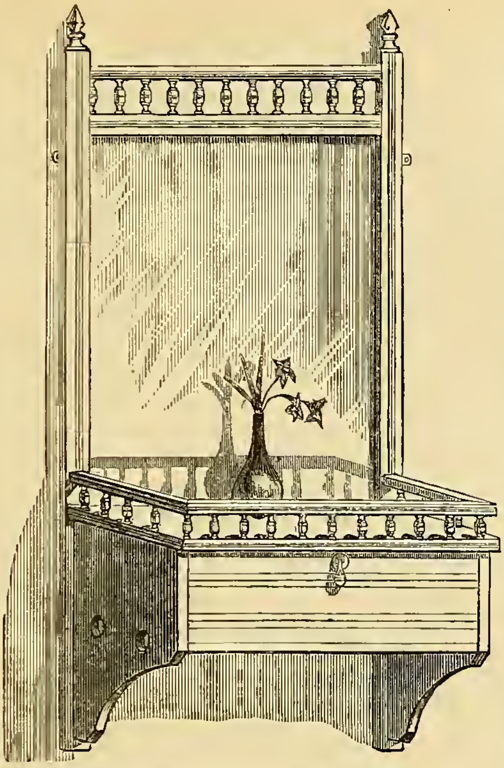


FIG. 1.—GLOVE LOCKER, COMPLETE.

ironmonger for 6d., may now he fitted. We next come to hingeing the door, this may be done with outside ornamental hinges, but a simple and inexpensive plan, which I find answers very well indeed, is to swing the door on pins. A piece of brass wire, or a small French nail with the head cut off, is driven through each side of the locker and into the ends of the door $\frac{3}{8}$ inch from the lower edge; to give room for the lower edge of the door to swing freely, a groove must first he cut in the floor of the locker; in cutting this groove great care must be taken not to injure the front edge. I have tried to represent how the door works in Figs. 10 and 11.

The hox should now be secured to the frame in its proper position by two screws passing through each side of the frame into the sides of

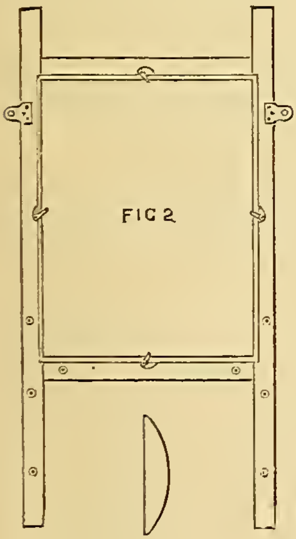


FIG 2

FIG 13

FIG4

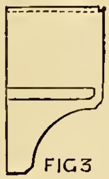


FIG3

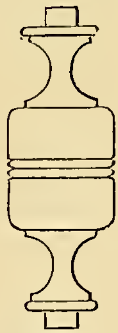


FIG 5

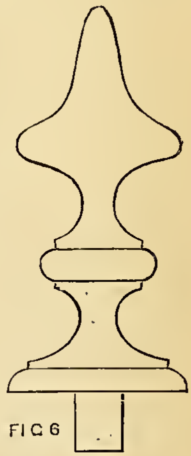


FIG 6

FIG9

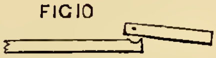


FIG10

FIG7

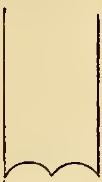


FIG8

FIG11

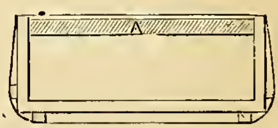


FIG12

FIG. 2.—BACK OF FRAME; Scale, 1 inch to 1 foot. FIG. 3.—BRACKET FOR BOX PART; Scale, 1 inch to 1 foot. FIG. 4.—TOP OF BOX, UNDER SIDE; Scale, 1 inch to 1 foot. FIG. 5.—SPINDLES; Full size. FIG. 6.—ORNAMENT ON TOP OF UPRIGHTS; Full size. FIGS. 7 AND 8.—BLADES FOR ROUTER; Full size. FIGS. 9 AND 10.—DIAGRAMS REPRESENTING WORKING OF DOOR. FIG. 11.—SMALL BRASS DROP HANDLE; Full size. FIG. 12.—METHOD OF CLOSING MITRE JOINTS OF MOULDINGS. FIG. 13.—SECTION OF BUTTON.

the box. When this is done, the upper surface of the top of the box should be flush with the upper surface of the lower cross bar of the frame. A piece of thin deal can be fitted in as a back to the box, but had better not be secured until after polishing.

We will now go on to the two rails. The top one is simply a bar $13\frac{1}{2}$ inches by $\frac{3}{4}$ inch by $\frac{7}{8}$ inch, beaded on the front surface. The lower one is made of three pieces mitred together. The beading should be scratched before the mitres are cut. The long piece for the front is $15\frac{1}{2}$ inches in length, the short ones are $6\frac{1}{4}$ inches—all three being $\frac{3}{4}$ inch by $\frac{5}{8}$ inch in the other dimensions.

Whilst I am speaking of mitreing, for the benefit of those amateurs who may not happen to know it, I will briefly describe a very simple, but effectual plan of holding picture frames in position whilst the glue is drying, which I have not yet seen described in AMATEUR WORK, possibly because it is so generally known; if this is the case, I apologize for troubling my readers with it. The method is shown in Fig. 12. The ends of the various pieces of moulding, or whatever the frame is to be made of, are glued, and the pieces placed in position on a table; a piece of string is then tied pretty tightly round the frame; two small blocks of wood are inserted between the string and the frame in the middle of each side of it. These blocks are then pushed up towards the mitred corners; the effect is to strain the string very tight, and to press the mitred surfaces together, and if these have been accurately cut, the frame is bound to have its angles right angles. In the case of the rail, a piece of wood of the right length must be placed between the two short sides as a support, and only four blocks used instead of eight. When the glue is dry, it is as well to make a saw-cut in each mitred joint, the cut being made between the two beads; a piece of veneer is then glued in, and worked down afterwards with the "scratch." This will scarcely show and will prevent the possibility of the joints giving way while the rail is being polished.

We must now go to the lathe and turn the spindles and the two knobs. In Fig. 5 I have given a simple form for the spindles. The number will, of course, depend on how close they are placed, and the position had, therefore, better be marked on a piece of stout paper cut to the size of each rail. If small holes are pierced in these in the right positions, the paper can be laid on each of the pieces of wood in which the spindles are to be fixed, and by this means the positions of the holes accurately marked. I think it will be found that ten spindles for the top rail and seventeen for the lower one, brings them a suitable distance apart. Besides these, two will want to be sawn in half longitudinally, and glued to the frame. The holes must next be bored with a small centre-bit or twist drill to receive the ends of the spindles and the two knobs on the top; for the latter I have suggested a pattern in Fig. 6. The spindles would take a very long time to polish, and they will look very nearly as well if they are varnished with fine hard varnish.

The four buttons to hide the screw-heads are all that remain to be turned, the section of these is given in Fig. 13. If it is preferred, these buttons might be replaced by pieces of wood being glued on to represent tenons attached to the floor of the locker, and passing through mortises in the sides with wedges through them to hold them in their place; or the floor of the locker might actually have tenons passing through mortises in the sides, and held in place by wedges. The box should now be unscrewed from the frame, the top detached, and all the different parts polished. When the polish is quite hard, the parts must be screwed together again, the top of the locker glued on, and the spindles glued into the holes. A screw had better be passed through the frame on each side to hold the lower rail in position, and a couple more might be put in to hold the top of the locker in its place.

The looking-glass may now be put into the frame, and a back of thin deal put in behind it; this may be kept in its place by a few brads driven into the frame, but a neater way is to cut recesses in the frame, and fix small brass buttons, as in Fig. 2. A couple of brass plates, by which to hang the locker, must be screwed on the back of the frame, and the whole is complete.

HOW TO MAKE A TREADLE TOOL-GRINDING AND SETTING MACHINE.

By the Rev. ALGERNON THOROLD, M.A.

IV.—LEATHER TONGUE TO PREVENT SPLASHING, ETC. —MODE OF COMBINING UPPER AND LOWER TANKS.

IT is often said that second thoughts are best: they may be, and, indeed, are, in some cases; but that the subsequent issue of events on lines of procedure suggested by second thoughts invariably tends to confirm the truth of this saying, is a dogma which no one who may be placed in the minority of the British Islanders, according to Carlyle's classification, will venture to insist. Second thoughts, or after-thoughts, call them as you will, are, nevertheless, frequently very useful, and such will be found, I trust, the embodiment in words and sentences of the following after-thoughts, which all the readers of AMATEUR WORK, to say nothing of the Editor and the writer, considered to have been brought to a fitting termination in the preceding

chapter. I trust, however, that the evident utility and desirability of one, and the diminution of labour and component parts in the construction of the other, will plead a sufficient apology for my reappearance, unbidden, in the pages of this magazine, something like an actor, who, after the fall of the curtain, makes his way on to the narrow space between curtain and footlights, much to the astonishment of the audience in front, and the stage-manager behind, in order to say something which he had left unsaid in going through his part, and which he thought a pity that it should be altogether lost on those who had been listening to him, even though its effect might be considerably marred by not being introduced just where it should have been.

FIG. 36.—LEATHER TONGUE FOR TANK.

But, lest I prove tedious in explaining why there should be a continuation to a subject which was supposed to have been brought to a conclusion, let me at once come to the main part of the business in hand. Turn back, if you please, to page 475, and there read the description of the mode of making the lower tank in which the grindstone revolves, and which catches the water that drips from the top on to the stone, and thence seeks a lower level by the law of gravitation, or is thrown from the surface of the stone by centrifugal force. Suppose the tank to have been made; this done, now take a slip of tin, the length of which shall equal the width of the tank, and $1\frac{1}{2}$ in. wide, double it along its length; between the two edges insert a stout strip of leather which shall project 1 inch beyond the line, and fasten it in place with three rivets, R, as shown in Fig. 36. Then solder the edge, A, A, of the tin strip along the front edge of the tank, at B, B, in Fig. 37, at right angles both to this edge, and to the stone, so that the leather will rub against the stone as it revolves, as illustrated in Fig. 38. This contrivance will prevent all splashing when the wheels are working, and will distribute the water equally over their surface.

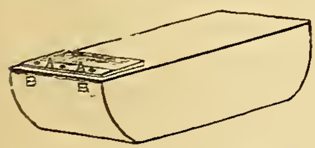


FIG. 37.—POSITION OF TONGUE ON TANK.

So much for the first of my after-thoughts; let us now proceed to the second, which is an alternative plan by which both the upper and lower tanks may be combined in one, a short description of which may perhaps be useful.

In the first place, instead of using metal, we altogether confine ourselves to wood. The appearance of the combined tanks will be as in Fig. 38. It will be seen that the backboard of the lower tank is carried up a short distance above the top of the wheels, and forms the back also of the upper or water reservoir.

This upper tank is really a small box fitted with a cover, which can be shut down when it is necessary to move the tanks from one stone to another. A sound piece of $\frac{3}{8}$ inch stave oak will be found the best material for our purpose, and though the sides and ends of these combined tanks may be simply screwed together, dovetailed joints will be found more satisfactory in the long run. It will also be advisable to give the interior of the tanks two or three thin coats of lead colour paint.

If we use wood instead of tin for the tanks, the strip of leather already described for spreading the water over the stone, and for preventing any splashing, must be screwed upon the corresponding edge of the tank. No difficulty will be experienced in fastening the small water cock, already spoken of, into the upper tank, which of course will be needed in one as in the other. But whether we use wood or metal, it will be found needful to afford an escape in the lower tank for the water which has been dropped upon the wheel. We can do this by cutting a hole as far back as possible in the bottom of the tank, and inserting a length of brass or other tubing, this may either be cut short, allowing the surplus water to fall into a can which we must hang below for the purpose, or it may be left long enough to convey the contents of the tank into any more convenient receptacle.

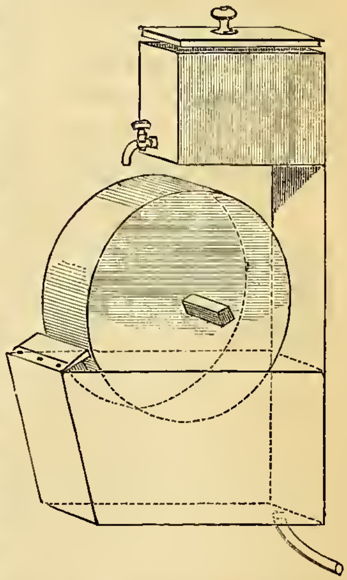


FIG. 38.—TANKS IN COMBINATION.

Now since experiment is the fertile source of all improvement, I have less hesitation than I otherwise should in giving you an account of still further results which have been brought to light by late careful work.

As the product, therefore, of further experiments, I think I ought not to keep back from you the fact that a better result can be obtained by the use of a solid wood wheel than I at first considered so good off the leather covered, or buff wheel. The edge, which on all flat tools must be an absolutely clean and true bevel, has sometimes, to my annoyance, assumed a

somewhat round appearance. For the alteration of this, subsequent consideration led me to believe, and a trial confirmed the idea, that a practically unyielding though still comparatively soft surface would ensure the desideratum.

I therefore commend the experiment to those who have followed me hitherto, and would suggest that an alternative wheel should be added to the machine, the buff wheel as already fixed, not being discarded, but used as a burnisher for work upon which a fair surface is required. The new wheel should be made by preference out of a disc of lime wood, and be cut from the trunk of the tree, across the grain, rather than from a plank.

I have now come to an end without any doubt whatever, and I will promise my readers that my next appearance shall be in connection with a fresh subject, and that for the future, I will endeavour to clear up everything as I proceed.

HANGING SHELF OR OVERDOOR.

By PITCHPINE.

THE furniture which I have hitherto described in these papers has been of the kind that may be more strictly classified under the heading of useful, rather than that of ornamental. Such ornament as it contained was simple, and merely sufficient to redeem it from obtrusive plainness. But now these conditions are reversed. Useful it is, of course, to a certain extent, as offering a good position for showing off a favourite vase, or some treasured knick-knacks; but the main intention in the design is ornament. Used as a hanging shelf, pure and simple, it will serve to ornament and furnish a bare wall space between two pictures; or placed over a door, with the lower edge of the back-piece of fretwork about an inch above the framework of the door, I venture to think that it is not a bad substitute for the ornamental piece of furniture usually known as an overdoor. It was with the intention of making it suitable for this latter purpose that I fixed upon the length as 43 inches, that being the width of the door and framework above which I proposed to hang the shelf. Of course, any reader making one with the idea of using it for this purpose, had better not take my measurement without question as being suitable for his own particular wants. Doors are not all alike, and anyone intending to make a shelf to be used as an overdoor, had better first of all measure the width of the door over which he proposes to hang it. If it is intended to be used as a hanging shelf only, in which case it will be fixed nearer on a level with the eye than if used as an overdoor, it would be as well, unless it is for a large room, to reduce the length of the shelf by a few inches. This is, however, very much a matter of choice, and if you make one exactly to dimensions described, I think you will not be dissatisfied with the effect.

The choice of wood depends upon the other wood work in the room. It should be in keeping with the general effect of the other furniture, and in harmony with its surroundings. If intended to be used as an overdoor, it will probably look best painted, in which case it can be made of good dry pine, except the framework for the ends, Fig. 1, which had better be of some hard wood (I used ash), and the fine fretwork round the top, which will cut best in pear wood or sycamore. The difference of the woods used in this case will not matter, as the paint will give them all the same appearance. By the bye, the paint, if you use it, must be put on with great care. On no account have too much in the brush, but use it—the brush—as dry as possible, otherwise the paint will collect on the edges of the fretwork and give your work a most clumsy, unfinished appearance.

The first thing to make is the framework at each end, shown in Fig. 1, the pieces which form the framework being B, C, D, $\frac{3}{4}$ of an inch square in section, as shown full size at C, Fig. 5. The extreme length of B is $17\frac{3}{4}$ inches, the portion above the cross-piece C being $2\frac{3}{4}$ inches. The finish at the bottom of this piece can be readily cut with the fret-saw. The front upright, D, is 8 inches long. The cross-piece, C, which is $8\frac{1}{4}$ inches long, connects the two uprights, B and D, having one end tenoned into each respectively. The tenon at F may go right through the upright and be wedged in the usual manner, as the back of B will be against the wall this will not show; but this cannot be done in the case of the tenon at D, for if allowed to come through it would show on the front edge. It must therefore be sunk only half way through the wood. In making this framework take care to keep the angles perfectly square. Do not glue up yet.

These two frameworks are connected together at the back by means of the piece shown in Fig. 3, and which is $\frac{5}{8}$ inch thick and $41\frac{1}{2}$ inches long without the tenon; a tenon shown at A being cut at each end, the uprights (one of which is shown at C, Fig. 5) having corresponding mortise holes to receive same. The position of these mortise holes can easily be decided when it is known that the back of the shelf comes between the dotted lines B and C, Fig. 3; and as the bottom edge of the shelf rests at each end on the top of the cross-pieces, C, Fig. 1, it follows that the point, C, Fig. 3, will coincide with the top line of the cross-piece, C, Fig. 1. By placing these two points together you can then mark off the position of tenon A, Fig. 3, on the inside edge of upright B, Fig. 1.

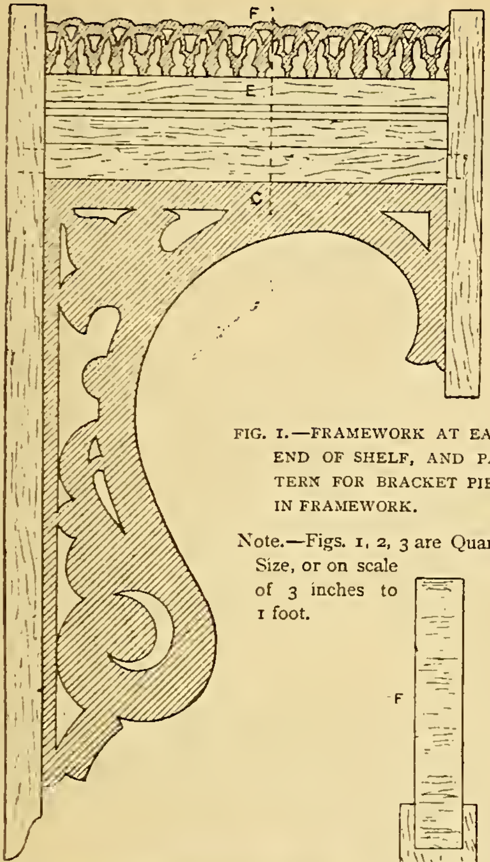


FIG. 1.—FRAMEWORK AT EACH END OF SHELF, AND PATTERN FOR BRACKET PIECE IN FRAMEWORK.

Note.—Figs. 1, 2, 3 are Quarter Size, or on scale of 3 inches to 1 foot.

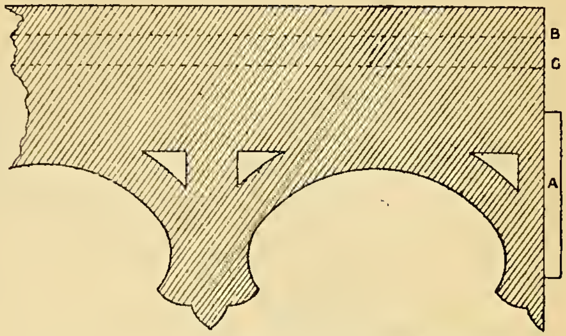


FIG. 3.—BACK PIECE CONNECTING ENDS OF FRAMEWORK.

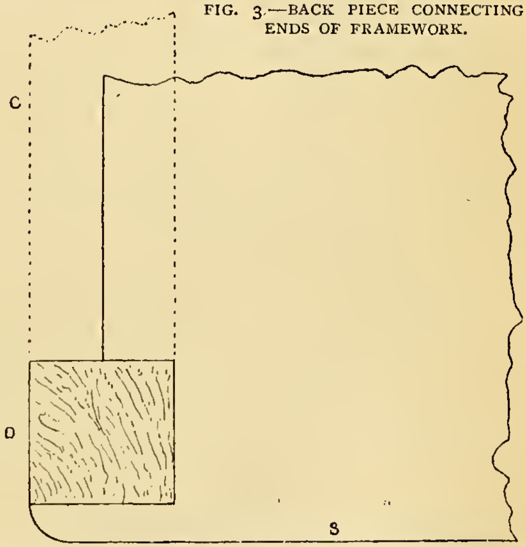


FIG. 6.—FULL-SIZED SECTION ON LINE D B, FIG. 1, SHOWING FITTING OF SHELF ROUND FRONT UPRIGHT.

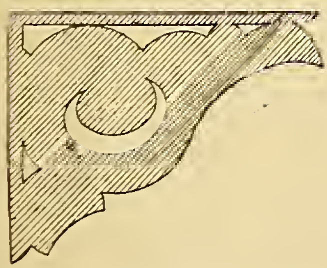


FIG. 2.—BRACKET PIECE UNDER CORNER OF SHELF IN FRONT.

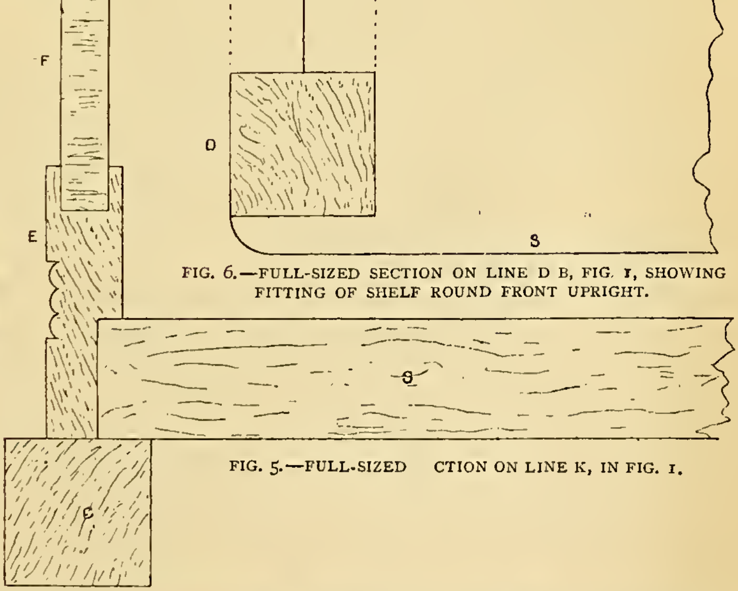
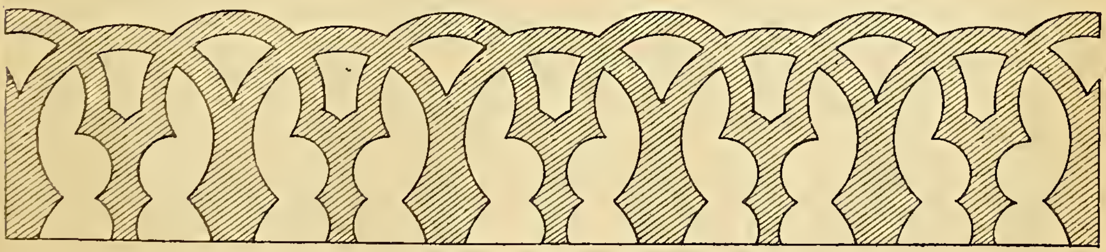


FIG. 5.—FULL-SIZED CTION ON LINE K, IN FIG. 1.



4.—FINE FRETWORK ROUND TOP OF SHELF—FULL SIZE.

Now carefully cut out the piece of fretwork shown in Fig. 1, of $\frac{7}{16}$ inch wood. It will be found to fit exactly in the lower part of the end framework, as shown in Fig. 1. If it be a good fit, it may then be glued up. You will require one piece for each end.

Having cut a groove $\frac{1}{4}$ inch wide and $\frac{1}{4}$ inch deep, along the top edge of the back-piece, Fig. 3, everything so far may be glued up. Glue up the two end pieces first, and when set, connect them by means of the back-piece, Fig. 3. Try all the angles carefully with the square before the glue sets.

Next, cut the shelf out of $\frac{5}{8}$ inch wood; this is cut a little wider than the framework, to allow the front edge being fitted round the front uprights, as shown in Fig. 6, in which S is the front of the shelf, and D the front upright; C, being the cross-piece between the front and back uprights. It will be seen that the end of the shelf rests on this cross-piece, coming halfway over it, and may be fixed thereto by a couple of thin screws. The shelf is also fixed at the back by screws through the back cross-piece, Fig. 3, into the back edge of the shelf. The end of the shelf is hidden by the strip of wood, E, Fig. 1, shown in full sized section at E, Fig. 5. This strip is cut to fit exactly between the uprights; it is rebated on the inside lower edge to fit over the end of the shelf. On the opposite side two or three reeds are run along the centre with the reed plane; and a $\frac{1}{4}$ inch groove is ploughed along the top edge to take strip of fretwork F. Having prepared the strip as described, fix it with glue only. The front edge of the shelf should have a reed run along it.

Having fixed the shelf, cut out the bracket piece shown in Fig. 2, and fix it by means of glue in the angle formed by the front upright, and the bottom of the shelf, so that it appears to support the shelf. Of course you will require one for each end of the shelf.

The job is now finished with the exception of the fretwork round the top. A pattern for this is given in Fig. 4, and if you cut six lengths as there shown, you will have enough to go round, and a few inches to spare to allow for bringing the joints in nicely. Having cut and fitted your fretwork, glue the bottom edge, and fix it in the grooves already made for it.

I cannot say much about the matter of finish; so much depends upon the kind of wood used in the construction of the shelf, as well as the position it is afterwards to occupy, and the surroundings amongst which it will be found, that it is best left to the taste and judgment of the maker.

The ends of the uprights I have left quite plain, and cut off square with the exception of the bottom ends of the back uprights. I like it as it is, but if you prefer it you might finish off with small turned knobs or pinnacles dowelled on to the ends.

A PLAIN BEDROOM WASHSTAND.

By PITCHPINE.

IN this paper I propose to describe an article of bedroom furniture, which will be useful to woodworkers who may require something plain and serviceable n this way. The washstand, if not capable of so much ornamentation as the dressing-table, is, at least, as useful and indispensable; and is one of those pieces of furniture for which it is difficult to substitute a make-shift.

Although offering less scope for the introduction of ornament than the dressing-table, there is still a tolerably wide margin in this respect; the stand I am going tc describe does not pretend to much ornament, but is of a very ordinary design, and would be hardly suitable to be used *en suite* with the dressing-table described in page 137, Vol. III. For this purpose one with tiled back would look better, but would of course involve greater expense and more work, though not to any great extent. I shall be pleased to give a further design for such a one in a future paper if it seems desirable.

The present design, however, will serve to illustrate the principles of construction, which are the same as for an ordinary table. It is, in fact, neither more nor less than a table with the addition of pieces on the back and sides of the top surface, for the purpose of preventing any of the smaller articles usually found on a washstand from being pushed off.

Of the various pieces of furniture hitherto dealt with in these papers, this one, is, I think, most easily and quickly made; and involves so few and simple operations in joinery that it really leaves me very little to describe.

Fig. 1 is a pattern for the legs, drawn to a scale ot $1\frac{1}{2}$ inches to the foot. It is not necessary that you should adopt this particular design, and if you have any favourite pattern that you prefer to this, by all means use it. Do not, however, if you can avoid it, use the ordinary pattern usually sold for table legs at about two shillings the set of four; they will give the table a decidedly common appearance, and having no square piece at the bottom of the leg, as at B, Fig. 1, they are not suitable for carrying the footboard although they may be made to answer the purpose.

The legs are cut from wood $2\frac{1}{4}$ inches, square in section; the square piece at the top, A, Fig. 1, is 5 inches long, and the square piece at the bottom, B, Fig. 1, is $1\frac{1}{2}$ inches long. The legs are shown in plan at A, A, A, A, Fig. 5; and are joined together by the pieces marked E, in Figs. 2, 3, and 5, which pieces are mortised into the legs as shown by the dotted lines at A, Fig. 1. I need hardly say that the mortise holes

must not, on any account, be cut completely through the legs, because of the unsightly appearance which the outsides of the legs would present if so treated. Before being glued up, the pieces E should have a bead run on the lower edge of each as shown by the double lines in Figs. 2 and 3.

Each front leg should be connected with its corresponding back leg, by a ½ inch rail, G, Fig. 3, let into a hole cut with a centre bit in the square piece near the bottom of the legs. These rails are for the purpose of carrying the footboard, Fig. 4, the end of which is shown at F, Fig. 3; and the front at F, Fig. 2. It is secured to the rails at each end by a couple of screws, put through from underneath the rail into the footboard.

The body of the table is now ready for the top, which is fastened in its place by means of blocks of wood glued into the angles formed by the pieces, E; and the underside of the top. It will be noticed that the top projects over the legs at the front and sides, but is flush at the back edge. On to this edge the back-piece, shown in Fig. 2, is screwed. The side-pieces, shown in Fig. 3, are next screwed in their places by screws put through from underneath the top, and also from the back-piece.

The table is now ready for whatever kind of finish you propose giving it. In this case, the design being a very ordinary one, it is perhaps as well to make it in deal and paint it.

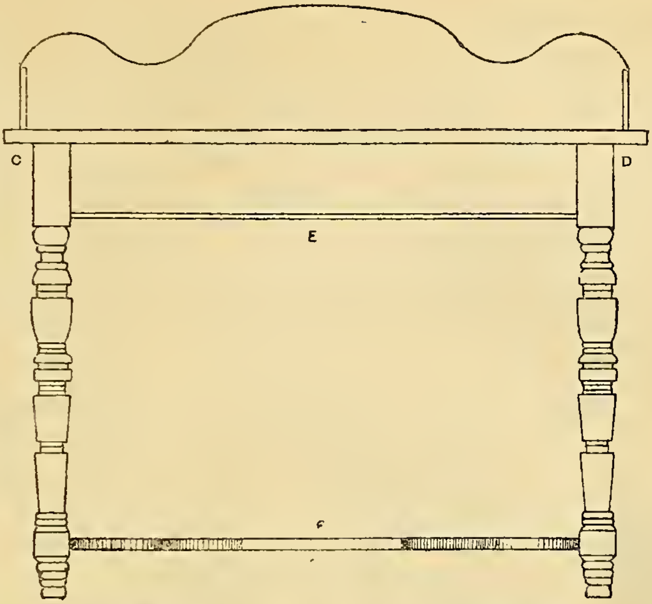


FIG. 2.—FRONT ELEVATION. Scale, 1 inch to 1 foot.

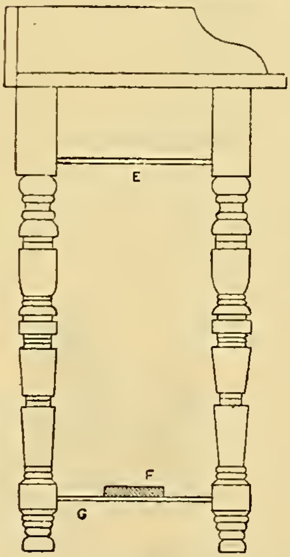


FIG. 3.—END ELEVATION. Scale, 1 inch to 1 foot.

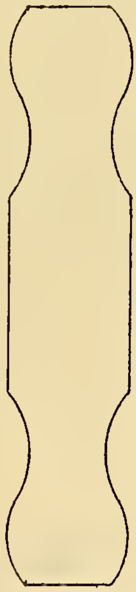


FIG. 4.—PLAN OF FOOTBOARD. Scale, 1 inch to 1 foot.

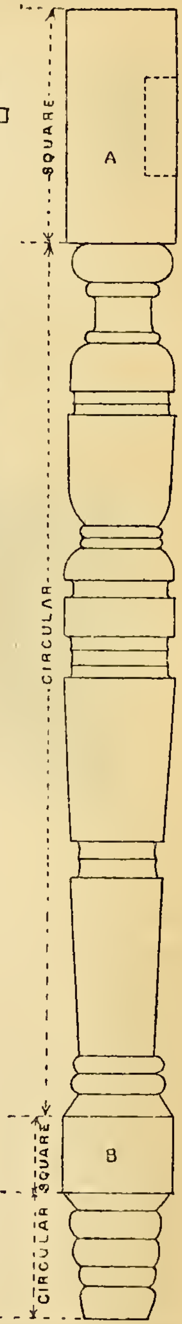


FIG. 1.—PATTERN FOR LEGS OF PLAIN WASHSTAND.

Scale, Quarter Size, or 3 inches to 1 foot.

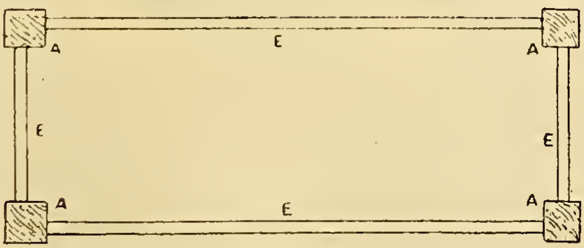


FIG. 5.—PLAN ON LINE C D, IN FIG. 2. Scale, 1 inch to 1 foot.

HINTS ON WOOD MOSAIC.

By "TWIST DRILL."

MOSAIC in wood, a variety of marquetry made at Nice and Mentone, is an interesting and effective kind of work for amateurs. The art is not difficult to acquire, and the results are pleasing. The designs usually consist of flowers inlaid in colours on a ground of light wood, which is generally olive. The coloured wood is holly, sawn in thin veneers, and dyed in the following tints :—

Black (ebony). | Grey. | White.
Shaded white. | Red, four or five shades. | Purple.
Blue, three shades.
Yellow, three shades.
Green, four shades.

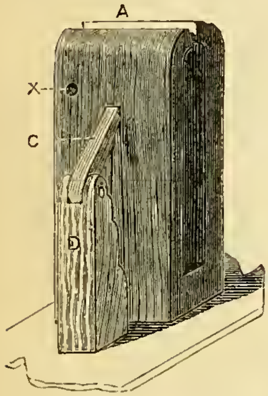


FIG. 3.—FRONT VIEW OF JAWS OF DONKEY.

These woods are $\frac{1}{16}$ inch in thickness, and the olive wood about the same.

The tools required are :—

Saw-frame, preferably a wooden one, as its lightness is a great advantage in turning corners. Saws, No. oo, or ooo, for fine work. Drill, a fine needle in a holder, with $\frac{3}{8}$ inch projecting. Scraper. Small hammer without a claw.

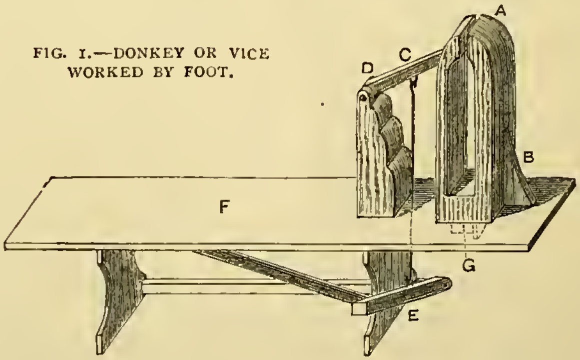


FIG. 1.—DONKEY OR VICE WORKED BY FOOT.

Donkey, Fig. 1. This is simply a vice worked by the foot. The jaws A are in one piece of walnut wood, but the left hand one is thinner, while the piece B makes the right hand one more rigid. These are fastened by a tenon and wedge G, under the bench. The loose piece C, hinged to the upright D, is depressed by the treadle and wire E, and forces the jaws together. The workman sits at F, (not astride the bench,) and depresses the treadle E with his left foot. Fig. 3 is a front view of the jaws. The dot at X represents a recess cut by a rose-bit; its use will be explained later on.

To begin, then, let us take a piece of olive or other veneer, and draw a leaf on it, as at A, in Fig. 2. Then lay a piece of green veneer at the back of it, holding them firmly together in the left hand ; drill a hole through both at one end of the leaf (holding the left forefinger opposite the drill, to avoid splitting the wood), with the drill upright. The workman having taken his seat at the donkey, the saw-frame, with the oo saw in handle jaw, should then be placed with the handle against the shoulder and the nut of the opposite jaw in the recess in Fig. 3. The saw should then be passed through the hole in the leaf, which is still held tightly in the left hand, and with the saw-frame a little pressed to strain it, should be fastened in the other jaw.

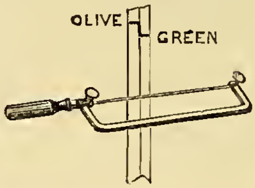


FIG. 5.—ANGLE AT WHICH TO HOLD SAW.

The two pieces of veneer, still held tightly together, should be placed between the jaws of the donkey, and held there by depressing the treadle (Fig. 4). Then, holding the saw in the right hand, the leaf should be sawn out, moving the wood with the left hand, and slackening the treadle slightly when necessary, as the wood should be fed to the saw, and the saw not moved except when turning the corner at the top of the leaf. In sawing, the elbow should be kept close to the side, and the saw held at a slight bevel. When the cut has been finished, the saw-blade should be loosened and removed from the work ; the two pieces of veneer should be laid, green upwards, on the bench, and the green leaf removed by means of the drill point. The piece cut out of olive may be thrown away. The green is now put in its place and driven in with the hammer, and a little glue rubbed on the back. If the saw has been held at the right bevel, with the handle jaw a little lower than the other, as in Fig. 5, the green piece will be found to fit tightly in its place. If it does not fit quite tightly a little hammering may enlarge it ; but if it is much too loose,

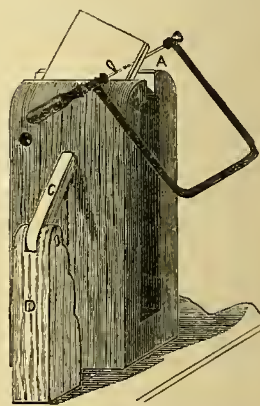


FIG. 4.—POSITION OF WOOD AND SAW.

another piece of green must be laid at the back of the hole in the olive, and the fresh leaf sawn out, keeping the saw well at the edge of the hole. If, on the contrary, it is too tight, drive it in slightly, lay a piece of waste wood at the back, put the saw in, and go along the line with the saw held at a less bevel; it will then be found to fit in easily.

After some practice with single leaves, then form B in Fig. 2 may be tried, where the inside angle will be found a difficulty. The saw should be kept working rapidly when turning it. The forms C and D may then be attempted, and then E, with a 000 saw, when the stem requires careful work. The direction in which the pattern must be cut is shown by the dotted lines. The form F is done in the same way.

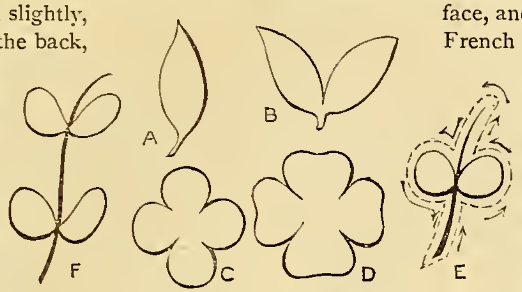


FIG. 2.—FORMS OF LEAVES, ETC.

I will now describe Fig. 7, a group of marguerite, pansy, and forget-me-not.

The design should be traced on tissue paper, and pasted on a piece of olive wood. A piece of dark red veneer should be taken, and the bud A B at the top of the design sawn out in one piece, and glued in its place. The bud C D C on the right hand side, half way down, must now be cut out in one piece. By this time the first piece will be sufficiently firm to cut the part A out in a lighter red. The bud C D C may then have the part D cut out in a still lighter shade. The leaves F and G may then be cut out in a yellow green, the leaf I in a grass green, and the leaf H in a darker shade. The calyx and stem, E E and K K of the two buds must be cut out in an olive green, and the larger leaves L M and N O N with the stem in the same tint. The leaves U U of the pansy must be cut out in yellow, the leaf V in orange, and the part O P R S T in dark red. Then turn to L M and N O, and cut out the parts M and O to the dotted lines, in yellow green. The part R of the pansy must be cut out of the red in purple, and the parts O and T in light red. The marguerite W X Y must be cut out carefully in plain white, the part X Y in yellow; and, finally, the part Y in orange; the forget-me-not Z A′ in dark blue, the centre A′ in lighter blue, and the stem and leaf B′ in slate. Of course each piece must be glued at the back before it is driven in, and hammered well to bring it level on the face, and, when finished, scraped and French polished or varnished. Previous to the varnishing, the leaves may be veined and the stamens put in with a pen dipped in Indian ink.

FIG. 7.—A GROUP OF FLOWERS.

Instead of being inlaid in olive, a piece of ebony may be used, cut to an oval, square, or round shape, and let into a solid piece of wood, in which a hole of the shape of the ebony, and of a depth equal to its thickness, has been cut with a chisel. If the ebony is inlaid on a curved surface it must be scraped thin and kept in its place with cauls, as in veneering.

Finally, the back of the work must be concealed either by gluing a piece of olive veneer at the back, or letting it into a solid piece of wood.

A selection of wood, tools, etc., may be procured from M. Maresca Raphaele, *à la Mosaique Fleurie, Menton, Alpes-Maritimes, France.*

Prices may be obtained on application in French or Italian: it will be no use to write to M. Raphaele in English. As the work is light and therefore suitable even for those who like to use their hands in work of this kind, but are not capable of much exertion, and as it presents a very nice appearance when finished, I am persuaded that many will take it up. It is desirable, however, that facilities should be afforded for procuring the appliances required and the necessary coloured woods, in this country; and to this end I venture to suggest that one or other of the enterprising firms who advertise in this Magazine, and who supply tools and wood for fret-cutting, etc., should communicate with M. Raphaele, with the view of acting as agent for the sale of his goods in this country. Indeed, I may add that Mr. Henry Zilles, 14, *South Street, Finsbury*, to whom I have spoken on this matter, has expressed his willingness to communicate with M. Raphaele, with the view of acting as agent for the sale of these woods, etc., in this country.

NOTES ON NOVELTIES.

By THE EDITOR.

47. The Britannia Company's Hot Air Engines. 48. Zilles' New Patent Pocket Knife. 49. Zilles' New List of Mouldings and Cabinet Fittings.

47. THE BRITANNIA COMPANY'S HOT AIR ENGINES.—Many readers of this Magazine have made inquiries from time to time with reference to cheap and effective motors for driving machinery, boats, etc., and attention has been directed by correspondents, chiefly from the other side of the Atlantic, to appliances of this kind, manufactured in the States. The Britannia Company, whose lathes, and wood and iron working machinery are too well and widely known to need mention here, being well aware of the want of a cheap, simple, and safe motive power, for various purposes for which hand labour has hitherto been much employed, and for amateurs, have recently augmented their considerable stock by the addition of two Hot-Air Engines, which merit the attention of all who stand in need of appliances of this kind. These Engines are illustrated in Figs. 1 and 2, of which the former represents a hot-air engine on Robinson's patent, and the latter on Knoeferl's patent. In general purpose these engines are similar, although they differ essentially in many points of construction, but these will be easily recognized and noticed on an inspection of the two illustrations. The engine on Robinson's patent is the larger and stronger engine. It is described as being simple, reliable, durable, economical, safe, silent, easy to start, free from smell, and requiring no skilled attention, all of which are qualities that are most desirable for a willing mechanical slave, whose only food is a little gas, and which is capable of working any kind of machinery within reasonable limits, including printing-machines, chaff-cutters, dynamo-electric machines, corn-crushers, emery and polishing wheels, coffee-mills and roasters, centrifugal fans, glass-cutting machines, fret and band-saws, drilling-machines, pumps, sugar choppers, rope-walk machines, organ-blowers, sewing-machines, rotary hair brushes, laundry machines, bottle-washing machines, malt-grinding mills, potter's wheels, amateur's lathes, and other machinery requiring motive power, which it would be tedious to enumerate. The following table affords useful particulars with respect to these engincs and will be found useful :—

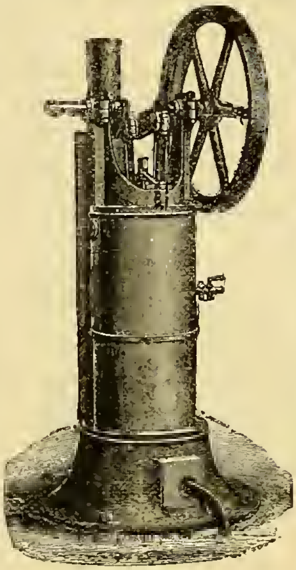


FIG. 1.—HOT AIR ENGINE (ROBINSON'S PATENT).

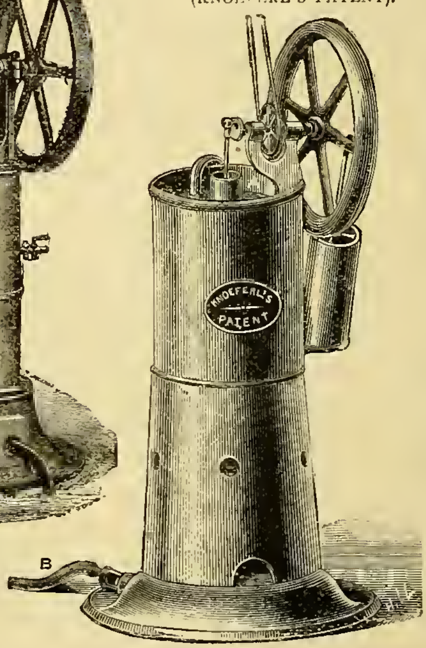


FIG. 2.—HOT AIR ENGINE (KNOEFERL'S PATENT).

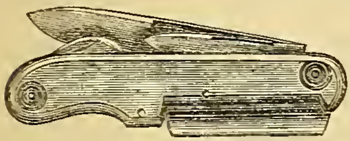
THE BRITANNIA COMPANY'S HOT AIR ENGINES.

Power.	Price.	Revolutions per Minute.	Diam. of Pulleys.	Approx. Cost of Gas per Hour.
One Man	£25	270	5 ins.	½d.
One and a Half Man.	£30	260	6 ,,	¾d.
Two Man	£35	250	7 ,,	⅞d.

These engines require no boiler, and are actuated by gas. The smaller engine, shown in Fig. 2, affords a cheap, simple, safe, and noiseless small motor for small machinery such as dental lathes and drills, pumps, fretsaws, sewing machines, punkahs, fans, etc. It is heated by a small jet of gas at the rate of about ½d. for three hours, or it may be driven by paraffin oil flame at about ¾d. per day. They require no attention beyond an occasional oiling, and can be managed by a boy. The price of the apparatus, as shown in the illustration, is £9.

48. *Zilles' New Patent Pocket Knife, etc.*—A very handy pocket knife, has been sent to me by Mr. H. Zilles, 14, *South Street, Finsbury, E.C.*, which is shown, drawn about half size, in Fig. 3, which accurately shows the shape and number of blades, etc. It is supplied by Mr. Zilles at 4s., postage 3d. It has two blades, one large and the other small, which appear to be of good quality, and which are extremely strong and well shaped. These blades are shown partly raised in Fig. 3. The small round-backed appliance on the left, which looks like a third blade, is a strong hook with a wedge-shaped edge, designed for cutting the wire of champagne and ale bottles, etc. Immediately below this hook, in some of the knives, is a round hole passing through the handle, into which the end of a cigar can be introduced and cut off by pressing the large blade down upon it. This hole is not shown in Fig. 3, and purchasers when ordering should state whether they wish for a knife with or without the hole. The tube in the lower part of the illustration covers a strongly made corkscrew, and is removed by unscrewing it. After the corkscrew has been used the tube or cap must be screwed up again tightly, so that the open side may come against the back of the knife and be concealed by it when the corkscrew is closed up. The knife can be conveniently carried in the waistcoat pocket. The handle is of German silver.

49. *Zilles' New List of Mouldings and Cabinet Fittings.*—Mr. Zilles also sends me his New List (No. 22) of Mouldings and Cabinet Fittings, and, when writing for it, applicants should be careful to give the *number* of the list, as named, to prevent any mistake as to what they want. I have often been asked where small mouldings and metal cabinet fittings of all kinds can be readily procured, because such things are but seldom kept in stock by ironmongers, and I am glad to think that no amateur need be under any difficulty in this respect for the future. The mouldings which are supplied in walnut, white holly, and oak, are made in eight sizes, ranging from about 1 inch to ¼ inch in depth, and are sold, No. 1—the largest size—at 6d. per foot run, Nos. 2 and 3 at 5d., Nos. 4, 5, and 6 at 4d., and Nos. 7 and 8 at 3d. Mouldings in other woods are made to order. Not less than 1 foot can be sold. The cabinet fittings comprise ornamental nails and studs of all kinds, made in various kinds of metal, with coloured centres to imitate pearls, rubies, etc., steel rivets, watch hooks, corner feet or knobs for cabinets, ivory knobs, hinges, bolts, brass and steel screws, iron and German silver rivets, side hooks, locks, lock ornaments, handles of all kinds, rings, pins and hooks for brooches, corner ornaments for books, escutcheons, etc. The charge for the list, which every amateur should have, is 4d., post free. Mr. Zilles, I may add, keeps in stock the light wooden bracket fret-saws mentioned by "Twist Drill" in the preceding paper on "Hints on Wood Mosaic."



ZILLES' NEW PATENT POCKET KNIFE WITH CORKSCREW.

HOW IT WAS MANAGED.

A SERIES OF PRACTICAL HINTS, SUGGESTIONS, AND WRINKLES.

FROM AMATEURS FOR AMATEURS.

VII.—HINTS ON GLUING UP.

[*From Q. E. D.*]

HAVING first learnt, through the notice given in AMATEUR WORK, of Le Page's Fish Glue, I have now for the last eighteen months used their Carriage Glue, and have found it such an immense assistance to me, that I think I may be benefiting other amateurs by noting my experience of the same. It most fully bears out all the makers claim for it; see original notice in AMATEUR WORK. It is always ready, goes a very long way, is very clean to use, and its immediate adhesive power is so great, that continuous pressure is not needed.

In many pieces of work there are parts it is impossible to cramp, or apply continual pressure to, and with ordinary glue it is difficult to make such hold; but with this carriage glue, the mere pressure of a few moments with the fingers, and the jointure is perfectly strong and permanent, and the need of brads or needle points quite done away with. It is also a great advantage in a large piece of work, with many small brackets, beadings, or such like appliances, to be able to go on fixing one after the other, without waiting for them separately to dry and hold. Besides this, the wood requires no heating, and as this glue does not set so quickly as common glue, one can take more time and is less hurried, a great advantage with a single pair of hands!

Another recommendation dwelt on by the makers, is the filling up an imperfect joint. It will sometimes happen, especially in a work that has to be taken to pieces, stained, polished, and then finally put together again, that a long joint may not be in perfect contact in its entirety; by working this glue into the open part with a needle-point, or such like, and wiping off with a moistened rag, the imperfections are most satisfactorily filled in and almost unnoticeable.

For large pieces of *appliqué* fretwork it is not quite so manageable; but for this the liquid glue of the same Company is completely successful. This is sold in 6d. and 1s. bottles, and it mends china also as well as the best cement. The present address of the agent, is—Messrs. Phillips and Co., 96, *Milton Street, Chiswell Street, London, E.C.*

Whilst on the subject of gluing, I might offer a hint or two to amateurs, in addition to those which I have already given in my "Hints to Fret Sawyers." Of course all amateurs know you cannot glue on a French polished surface. To scratch the polish off neatly, without breaking up more than you wish, is a difficult job. The best plan is, after staining or preparing the wood, to gum with thin gum, pieces of tracing paper on the parts where glue is to be used. After polishing, these can be easily plied off with a thin penknife blade, using water if they have adhered too tightly. I say tracing-paper, as the gum does not penetrate this like ordinary paper, and, as a rule, by carefully getting up one end with the knife, they strip off without the least trouble, leaving a perfectly clean cut through the polish to glue on the article it is prepared for. To put together any pieces of thin wood edge to edge, as, for instance, pieces of fretwork in the corners of mirrors, etc., glue up with Le Page's Carriage Glue; when dry, glue neatly on the back slips of papering canvas, covering each joint; do this with ordinary glue, heated as usual, and whilst still wet, with the brush or finger tip, run more glue over this again; this will dry as hard as a piece of metal, and the joint be practically unbreakable. Of course these are but A B C affairs to professionals, but may be useful hints to amateurs.

As a beginner, I was very much puzzled how to screw on the hinges holding the back supporter to an easel or frame; by some I was recommended to try a crooked screw-driver, specially invented for this purpose. The ridiculously easy solution of this difficulty is—put your hinge in the vice, knock out the pin, screw half the hinge on the back of the frame, the other half on the supporter, put together, and slip the pin in again.

VIII.—MY MORTISE GAUGE AND BORING GAUGE.

[*From J. W. S., Orkney.*]

In this short paper I intend to give the readers of AMA-

TEUR WORK instructions for making two very useful tools. The first is a screw gauge for mortises; without this gauge the amateur cannot make a very exact job. I having been a reader of AMATEUR WORK from the first, I have found it of great service to me, especially in the papers on home-made tools; and I think it my duty to give a short paper on the above tools, which I will describe as clearly as possible. In the first place, we will set to work to make our mortise gauge; of which a complete sketch is shown in Fig. 3. First, let us procure a piece of hard wood. I made mine of beech. I made the block first; I squared it up on all sides, a representation of the square is shown at Z, Fig. 1, with the hole in centre for screw. Then screw a bit of round iron, ⅜ inch in diameter, drill a hole in the centre of it, as shown at X, Fig. 1. The screw complete is shown at Y, Fig. 1; C, collar to keep slide in place. Bore a hole in the centre of the staff for the screw, then bore a ⅜ inch hole across the staff for the screw X. Be sure to put the screw X in so as to let the screw Y pass through the centre of it, as shown at F. Then cut the slide about ⅜ inch from end; drill two small holes for the marking points P, P, as in illustration, and fix the short piece with a small screw nail, as shown at

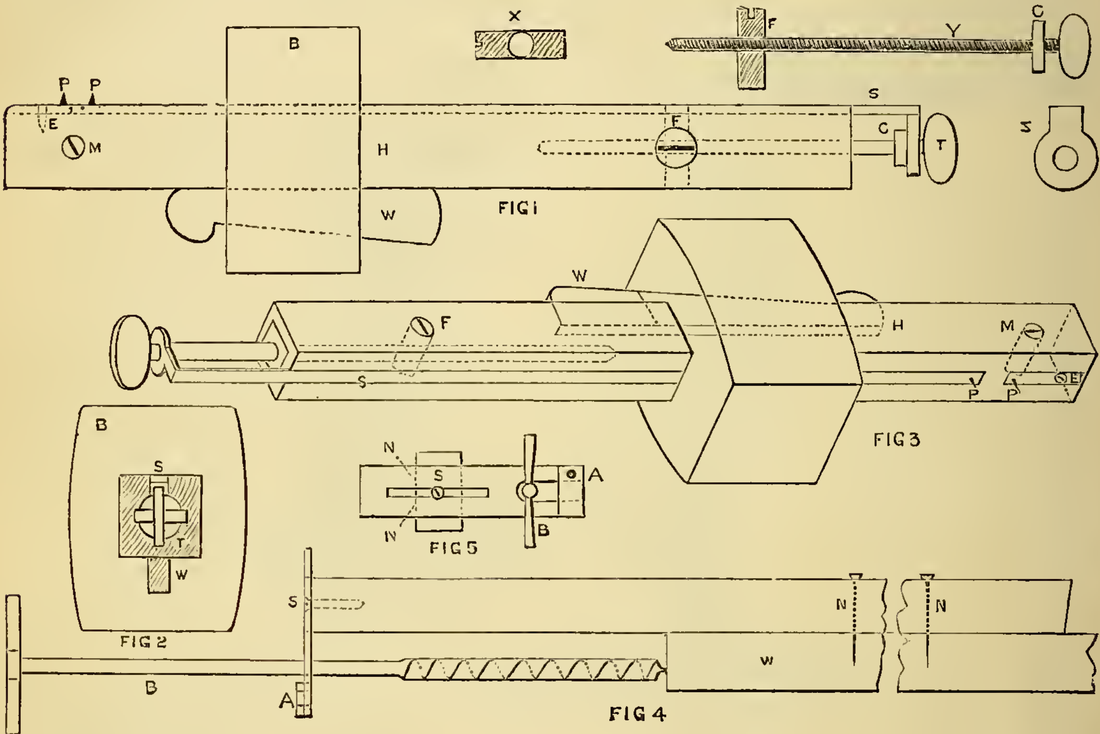


FIG. 1.—SIDE VIEW OF MORTISE GAUGE. FIG. 2.—TRANSVERSE SECTION THROUGH BLOCK. FIG. 3.—PERSPECTIVE VIEW OF GAUGE COMPLETE. References to Letters in Figs. 1, 2, 3: T, Thumbscrew; S, Slide; P, P, Marking Points; B, Block; W, Wedge; F, Fixed Screw; M, Single Marking Point; I, Small Brass Plate sunk in Wood to prevent wearing; C, Collar to keep Slide right; H, Staff; X, Form of Fixed Screw, F; Y, Form of Thumbscrew, T, with Fixed Screw, F, on; Z, Form of Collar, C. FIG. 4.—BORING GAUGE, SIDE VIEW. FIG. 5.—PLAN, SEEN FROM TOP. References to Letters in Figs. 4, 5: A, Auger; S, Slide Screw; N, N, Nails for Fixing to Board; W, Thin Wood; A, Stop.

then I dressed the staff to 1 inch square. I gauged the centre of block to the size of the staff. Then the easiest way is to bore a hole with a bit and square it out with a chisel. When you have got the block fitted on to the staff, then run out a groove in the centre of the staff for the slide, ¼ of an inch wide by ⅛ of an inch deep, as is shown at S, Fig. 3. Your slide, which is made of iron, must be made by a smith, from whom you will get it at a very trifling cost, probably for nothing, if he be a friend. The slide is made by taking a piece of iron the size of the groove in the staff. Then turn a square on the one end which has been prepared with a round, then drill a hole in the centre of the round; be sure to drill it that the screw will go into the centre of the staff; E, Fig. 3. Then fix a single prong in another side, as M. Fix on the block with a wedge W. Cut a small groove for the prong P to slide through. Fig. 2 is an end view of gauge.

Figs. 4 and 5 are illustrations of a boring gauge. Take a piece of hard wood about 20 inches long, then take a piece of hoop and cut a slide S, as in Fig. 5; and at one end cut a slide for the auger, as at A, Fig. 5. Take a small piece of iron and fix across the points, as a sneck for keeping in auger as at A; B, auger in slide and sneck A shut. W, thin board in place for boring the gauge, is fixed on the wood with two nails N, N, driven in in a slant not to come in the way of the auger, and not vertical as shown at N, N, Fig. 5. Two wire nails are preferable.

AMATEURS IN COUNCIL.

1. *Contributors to* AMATEUR WORK *are requested to write on one side of the paper only, and Correspondents when asking or answering Questions in "Amateurs in Council," are also requested to write on one side of the paper only.*

2. *When Illustrations or Diagrams are necessary, draw them on a separate piece of paper, because the "copy," as the manuscript is technically called, has to go to the printer, and the illustrations to the engraver.*

3. *Abstain from the epistolary form, as it is utterly unnecessary, unless in letters of business. Put the question you wish to ask, or the reply you wish to make, as briefly as possible, and write every separate question and every separate reply on separate pieces of paper. Sign each with initials, nom-de-plume, or name and address, as preferred.*

4. *Let every paper be headed* AMATEUR WORK, *and follow these words with* "Information Sought," *when it is a query;* "Information Supplied," *when it is an answer to a query; and* "Sale, Purchase, and Exchange," *when it concerns anything to buy, sell, or barter.*

5. *It must be fully understood that no attention will be paid to any letter or communication in which these rules are not rigidly observed.*

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine, the information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

Paper-Hanging.

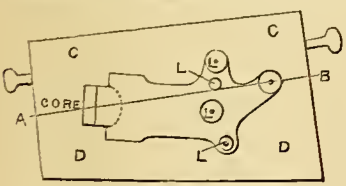
E. H.—You will find instructions on this subject in Chap. IV.—"Paper-Hanging: How To Do It"—of Mr. Edwinson's "House Painting and Papering," in page 434, Vol. II. (or Part 20, July, 1883) of this Magazine.

Electroplating.

R. H. (*Limerick*).—The instructions for making a "proper mixture for electroplating metals, or silvering them in such a manner" as to make them "equal in all appearances to real silver," were given in the first six Parts of AMATEUR WORK. I must request you to get those parts and carefully read them, and put the instructions into practice. Then, if you get into any difficulty, and will let me know wherein you have failed, I shall have pleasure in assisting you with my advice. There is no royal road to this art, nor any easy method of learning it. Careful practice will be required ere perfection is reached.—G. E.

Pattern for Headstock.

A. F. S. (*Dresden*).—The method I should adopt would be to make the joint of the pattern, and the mould along the line A B, in the annexed illustration, making the pattern in halves, as in this case it would be the cheapest moulding. The top box is to



PATTERN FOR HEADSTOCK.
A B, Joint of Pattern Mould; C, Top Box; D, Sand Mould; L, Loose Washer.

be lifted vertically, and all washers, etc., loose, but you would require a tail print on the hole, thus marked. If not explained sufficiently, or if you want advice on anything else, I shall be most happy to give it. As drawn, the pattern would not come out as stated without the core underneath the arm, as shown.—A. J. S.

Boring Model Cylinder.

C. J. D.—Suppose your cylinder is $\frac{1}{2}$ inch bore in the rough, and that it is required to be $\frac{5}{8}$ inch bore when finished. To accomplish this, turn up a piece of hard wood to the form given in Fig. 1, viz., $\frac{1}{2}$ inch diameter for a distance equal to length of cylinder, and the remainder $\frac{5}{8}$ inch, or equal to finished bore. The $\frac{5}{8}$ inch part is shown broken off. It may be any convenient length so as to admit of being held and actuated by hand. A saw cut is now run

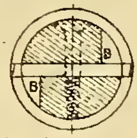


FIG. 3

BORING MODEL CYLINDER.

Fig. 1.—Hard Wood to carry Cutter.

Fig. 2. — Section of Wood.

Fig. 3.—End View.

FIG 1

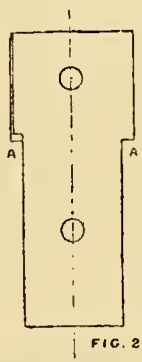


FIG. 2

up as shown, and a steel cutter prepared to the section of the wood, as shown in Fig. 2. The holes are for wood screws to secure the cutter. At A, A, Fig. 2, the shoulders are bevelled to form cutting edges, and the corners, or external angles, should be rounded slightly. Fig. 3 is an end view showing clearance at B, B, in front of each cutting edge, so that the chips may fall out. The above will, I trust, give an idea of the principle which may be modified to suit circumstances or requirements. If further information is required in the matter, I shall be happy to oblige.—OLLA PODRIDA.

Focus for Object Glass.

J. W.—Please turn to page 594, Vol. III., and you will see that your question has been put by J. M. (*York*), and answered by me. —F. A. E.

Boat Building with Willesden Waterproof Paper.

C. H. O. (*Cairo*) writes:—"I should be glad if R. C. C. (page 404) would give in AMATEUR WORK the result of his experiments with Willisden Waterproof Paper for canoes, as in all probability it would interest others as well as myself; also, his plan of dividing the canoe for travelling might be detailed a little more fully, if he would not mind the trouble." [The pages of the Magazine are open to R. C. C. if he likes to comply with C. H. O.'s request.—ED.]

Violin Making.

S. M. L. (*Goderich, Canada*).—I have posted the portion of your letter in which you refer to Mr. E. H. Allen, to that gentleman, and have requested him to reply to you. You certainly have good reason for supposing him to be "*non est*," as you put it; but I do not think he has gone over to the majority.

Bookbinding.

FENMAN.—The exact size to which the binders employed by the publishers cut the millboards for AMATEUR WORK is 10 in. by $7\frac{1}{8}$ in.

Photography.

(1) BELLOWS FOR CAMERA.

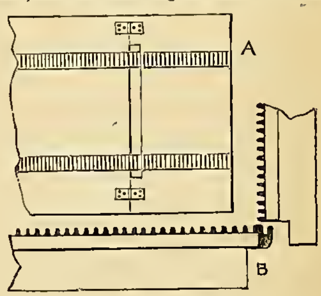
S. M. L. (*Goderich, Canada*).—I do not know the rubber camera bellows you ask about, but cloth camera bellows may be bought from Messrs. Lancaster at 3s. for $\frac{1}{2}$ plate, and 4s. 6d. for $\frac{1}{1}$ plate; and leather bellows at 5s. for $\frac{1}{2}$ plate, and 7s. 6d. for $\frac{1}{1}$ plate; the postage by sample post should not come to much; but I cannot give the exact weights of these bellows.—J. P.

(2) LENS FOR SMALL PORTRAITS.

C. J. (*Nottingham*).—You can get a view lens from Lancaster's for 5s., which will take a view up to the ordinary carte de visite size, or one for 10s., which will take up to cabinet size. There is no difference in the lenses used for taking ferrotypes. As to a camera, the one you mention is only a toy, and of no practical use; but having proved yourself such a clever workman in the other branches you name, you will probably find no difficulty in constructing a camera from the directions given in former Numbers of AMATEUR WORK.—J. P.

(3) RACKS FOR CAMERA.

X. Y. Z.—You say you have cut the racks for your camera so that the ends of the long pieces are immediately over the division in the base-board, and this is just where you have gone wrong. I have not Mr. Parkinson's articles by me to refer to at the moment, but the following sketches will show



BASE-BOARD OF CAMERA.
A, Plan; B, Section.

you how to place the racks. Fig. 1 is a plan of the base-board; you will see that the racks are not divided in a line with the centre of the hinges, but the ends of the long pieces overlap the division in the base-board, a rebate being cut in the short part of this latter to receive them. Fig. 2 is a section of the base-board made through the racks.—J. P.

Chicken Coop.

E. A. M. (*Sheffield*).—The lightest thing you could have in the way of a chicken coop is a framing of wood, covered with wire netting with $1\frac{1}{2}$ inch mesh. First make two frames for the ends, then connect these ends with bars, and fill up the ends, sides, and top with wire netting. Make it large enough to put a box with slanting roof, and slips nailed on the bottom to keep it off the ground, as a shelter for the hen and chickens by night. It would be well if you made a separate framing for the whole or part of the top, for convenience of putting in water and food, other than corn, which can be thrown in through the wires. I recommend you, however, to adopt, and make the excellent Hatching Box, described and illustrated by F. Hassard, in Vol. II., pp. 281, 282, or Part 17, April, 1883, which you can buy for 6d., if you have not a complete set of the Parts or Volumes.

Organ Building.

(1) ORGAN KEYS FOR AMATEURS.

*** I am requested by MR. GEORGE DEWAR, of 68, *Carlton Street, Kentish Town, N.W.*, to say that he has removed from *Drummond Street* to the address now given, and that if any amateur organ builders require organ keys, he is ready to supply them as usual.

"Amateur Work" in Sierra Leone.

SHODOONKEH sends me No. 2, Vol. II. of "The Artisan," a record of Industrial Progress in Sierra Leone, West Africa.—"Something New. Our amateur scientist, etc., Mr. T. A. Wilhelm, has lately added to our surprise at his ingenuity when he walked into our office the other day with a telescope and stand constructed by himself, the tubes or cylinders which form the section of the telescope being made of layers of brown and cartridge paper, with an accuracy and finish that augments our surprise. But our surprise was yet to come when on directing the telescope to a distant object we saw it with a clearness that baffles all attempt at description. The instrument is 5 feet 4 inches long, of three draws, the diameter of the object glass measuring 3 inches. The stand, which is constructed for observation of distant objects and astronomical researches, is another piece of ingenuity surprisingly pleasing. It is formed of a pivot and slide, which turns it easily to the right or left, elevates or depresses it according to the fancy of the observer. The whole thing seems too much to be accomplished by a young man whose time is fully occupied by other duties, and yet serves to point out the value of time wasted by many young men who might have been to-day bright and useful members of some scientific or mechanical pursuits. Why have we so few photographers and artists, electoplaters and gilders? Why no skilful tanners? Why no engravers? Why but indifferent watchmakers, etc.? all employments that may be perfected in the leisure hours with much pleasure not unmixed with profit. Mr. Wilhelm is at home in the evenings, and will be happy to show any person interested in his development of native genius, some of his works. He is at present engaged in the construction of a microscope of exceeding great power of observation. We wish Mr. Wilhelm a long and useful career in his scientific and other researches, and that he may develope the useful and the ornamental for his country's good." I cordially echo the good wishes of the editor of "The Artisan" in behalf of Mr. Wilhelm. SHODOONKEH further writes me that "for the method adopted in making the tubes of the telescope, Mr. Wilhelm is indebted to Mr. Mark Wicks, in his article on 'Organ Building,' in 'Ours,' and to Mr. O. Beckerlegge for the mode of setting or mounting the lenses in his article on 'A Cheap and Useful Microscope;' and last, but not least, to Mr. J. Lancaster, 37, *Colemore Row, Birmingham*, for the distances between the lenses, etc."

Electric Light for Bicycle.

MAGNET.—I had a few trials with a friend on this sort of business a short time ago, but it was never satisfactory, and the usual oil lamp was finally resorted to. The light tried all sorts of fantastic tricks: an extra dark night it would act stupidly, and if it was not specially wanted, it would display such an amount of willingness to make itself useful that was utterly exasperating. You might try Dale's granule battery, and also look up Mr. Edwinson's excellent papers on electric lighting.—LEBASI.

Motor for Vacuum Tubes.

MAGNET.—The tubes are simply placed in the holders, one end of the tubes being put in one of the circular holes of the holder so that the other piece of flat brass of the holder presses out the platinum wire of the tube. The other holder is simply slid down on the other end of the tubes, and then a turn of the thumb-screw makes all fast.—LEBASI.

Waxing Mouth-Pieces of Clay Pipes.

A WANDERER.—The ends of clay pipes—old-fashioned "church wardens," and all of them—are made comfortable, for the lips of smokers as you say by "waxing." All you have to do is to hold the end in a hollow space in a clear fire to heat it, and then rub it over with sealing wax of any colour you may prefer.

Tightness of Lathe Mandrel in Bearings.

BLIKNEUS (*Cape of Good Hope*).—The lathe mandrel should just run free of shake endwise, or be movable in that direction almost literally a hair's breadth. As to "play," it should have none. Keep it oiled, and it will last thirty years or more if a Holtzapffel.—J. LUKIN.

Cheap Microscope.

A DISAPPOINTED ONE.—I have sent your postcard to O. B., who, as you rightly conjecture, is the writer of the article. The excuse of the optician probably will be that the size of the lens was not exactly specified by you. Dealers do not care to be referred to magazine articles for the specification of the article wanted. It seems that some mistake has been made; but I have no doubt that if you return the glasses that are unsuitable, and explain in writing exactly what you require, that the optician to whom you refer will give you the proper lens in exchange for them.

Pianoforte Tuning.

AMATEUR PIANO MAKER *alias* W. J. R. E. (*Rusden*).—I must apologise for allowing your queries to remain so long unanswered, and must express my indebtedness to our Editor for having specially brought them to my notice. The horse has not been unwilling to drink, but it had not come to the water. The fact is that intense pressure of my ordinary work at Christmas last had among other results the omission to provide myself with the December part in which your inquiries appeared. I am pleased to know that my papers have not only assisted you, but have had the still more satisfactory result of inducing reflection. The difficulty to which you refer is one which I fancy you will not find generally admitted; but the mode by which you propose to overcome it is not only legitimate, but is a perfectly logical procedure in sequence to tuning with the monochord, when with increased experience that help is discarded. As to the beats between the tempered and perfect notes of the same name, they must of necessity differ from those between the root and the tempered note, and the mean result of my experiments on the lines of your questions is that the tempered fourth (the nearest to perfection) gives about 5 beats to 10 seconds, the fifth 7, and the third 13.—W. W. C.

Photographic Apparatus Fittings.

J. C. (*Stoke Newington*).—The writer of the papers in question who, for some reason which he has not vouchsafed to explain, left them uncompleted, is answerable for the address given. I cannot possibly divine why you and your friend have had no reply to your letters. Probably a letter or visit to Messrs. H. and E. J. Dale, 26, *Ludgate Hill, E.C.*, would obtain for you the fittings you require. It is worth the trial.

The "Shipman" Engines.

Mr. G. BUSSCHOTS writes:—"In reference to WESTWOON's inquiry on this subject I beg to state I have had several American price lists of the 'Shipman' Engines, and find them all different in prices. In one list I find No. 1, 50 dollars; No. 2, 75 dollars; No. 2, the new and improved, 125 dollars. In another, No. 1, 100 dollars; No. 2, 125 dollars; No. 3, 175 dollars; so I find it myself a mixture which I cannot understand. I have written to the 'Shipman' Engine Company for explanation, but have not received any reply as yet. When I hear from them I will let you know the result."

WESTWOON.—I am much obliged to you for your courtesy in sending me your price list of the 'Shipman' Engines. The above communication from Mr. G. Busschots of 33, *Park Lane, Liverpool*, throws light upon the subject, and shows that there are two sides to the shield. You do not give your name and addres. If you will do so, I will return your price list.

Sharpener for Lawn Mower.

W. B. (*Whitehouse, N.B.*)—You will find a notice of the "Challenge" Lawn Mower Sharpener supplied at 4s. by Messrs. Charles Churchill and Co., 21, *Cross Street, Finsbury, London, E.C.*, in page 449, Vol. II. of this Magazine, or otherwise in Part 20, July, 1883.

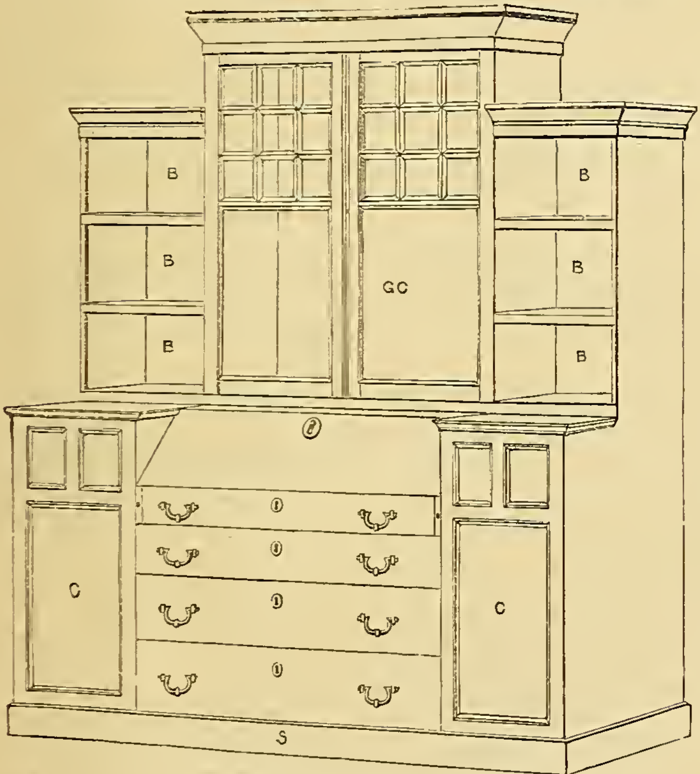
Attachment of Scroll Cnuck by Means of Face-Plate.

BLIKNEUS (*Cape of Good Hope*).—You will observe that as the face-plate is turned to fit correctly inside a recess in the back of the chuck made to receive it, the centrality of the whole is at once secured. With a graver or point tool mark on the face-plate a circle of the size of that which would comprise the centres of the tapped holes in the chuck, and then, either by means of the division plate or a pair of dividers opened to the diameter, set off three equidistant points in the circle marked on the face-plate, and centre punch these for the drill. In this way you have no need to take the chuck apart to mark through the tapped holes. You can hardly fail to make the drilled holes agree with the others, and you can give a little play so far as to allow the screws to pass with ease through the face-plate. I am glad my books have been of service in teaching you lathe work.—J. LUKIN.

INFORMATION SUPPLIED.

Enlargement of Bureau.

MR. GLEESON-WHITE writes to IONA—"In reply to your query, accompanied by a rough sketch of the form of your bureau, the accompanying illustration will give you an idea for its enlargement. Excluding all but simple joinery, it will be seen that a cupboard with glazed doors, the upper part of each in nine small squares, and the lower plain glass is superimposed on the flat top of the bureau; and on either side are two cupboards, from the floor to complete height of present bureau, standing out flush with it. These carry bookshelves the same depth, or an inch or two less if preferred, as central cupboard; these are not carried to the full height of the centre, a skirting runs round the bore, hiding the present legs of bureau, and bringing the whole into one. If the additions are to be made in mahogany, it will be easy to stain to match old wood; but stained deal will certainly betray itself; but as so little of the old wood shows, it would be best to ebonize the whole, to avoid the patchy effect of real and sham, side by side."



METHOD OF ENLARGING BUREAU.—B, Bookshelves; C, Cupboards; G, C, Cupboard with Glazed Doors.

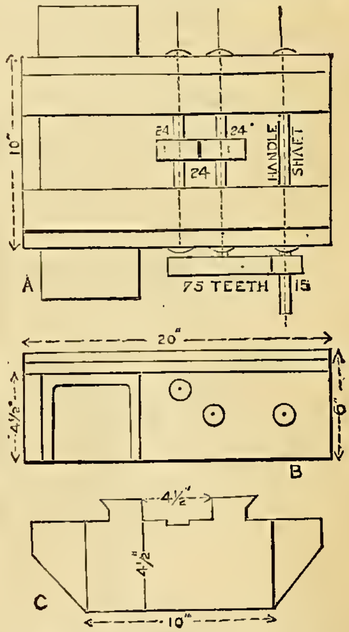
Pressure Gauges.

A. F. S. writes:—"I must caution S. M. L. (*Goderich, Canada*) and others against making Pressure Gauges, as the safety of the boiler depends on them. They are extremely difficult to make unless self-acting machinery is to hand. I have known people to put implicit trust in a gauge that registered 10 lbs. for 25 lbs. If S. M. L. wants a gauge, he had better write to a gauge maker, as model makers clap on the prices. Schaeffer and Budenberg ask, 15 and 30 marks for gauges 25 millimeters diameter (about 1 inch), and 24 marks for one of 40 millimeters diameter ($1\frac{9}{16}$ inch). The cheapest work on the Bourdon principle, while the others have a steel plate spring."

INFORMATION SOUGHT.

Planing Machine.

A. F. S. (*Dresden*) inquires:—How can I make a reversing motion to a hand-planing machine? The present plan of turning first one way, and then the other, is nothing short of barbarous. I have lately devised three plans, but I find that two are patented, while the third is useless for machines working with a rack. I want something that will not make an over-powering noise. It must also work easily with a fly-wheel. There is room for much improvement in hand planers. I enclose sketch of present bed, but I will make another bed if any useful plan can be suggested. [I reproduce the sketches sent. With regard to your own plans, the third is out of court, as a matter of course, but surely the



BED OF HAND-PLANING MACHINE.
A, Plan; B, Side Elevation; C, End Elevation.

other two cannot tally precisely in every point with those which you say are patented; and even if they do, which is unlikely, if they are good plans you might adopt either of them with safety, as you are making for your own use and not to sell.—ED.]

Light Carriage for Disabled Persons.

REDPEN asks:—Can any reader give a description how to construct a light carriage, suitable for a man who goes on crutches. One that he would be able to drive himself. He can use both hands, and also left foot. Anything that might be required in iron work could be got easily.

Glass Turning.

J. M. asks:—Will any reader inform me whether glass can be turned or not, and if so, in what way, and the size of cuts that can be taken off?

SALE, PURCHASE, OR EXCHANGE.

Persons availing themselves of this Department of AMATEUR WORK *are requested to note that—*

(1) *No Trade Advertisements can be inserted in this Department, which is open to bonâ fide Amateurs only. The Editor reserves the right of refusing to insert any notice.*

(2) *No charge will be made for the insertion of notices until their number be such as to render it absolutely necessary to do so.*

(3) *Persons writing in reply must forward application under cover to the Editor, in an envelope sealed down, with a Penny Stamp attached in the upper right hand corner, and the* NUMBER *of the notice in the lower left hand corner thus :—*

	STAMP here.
NO. OF NOTICE here.	

(4) *Letters thus marked and enclosed under cover to the Editor will be forwarded immediately to owners of articles for Sale or Exchange, or persons wishing to purchase. No attention will be paid to any communications in which these Rules are not strictly observed.*

(5) *It is desirable that those who reply to notices in this Department should enclose to the advertiser, with their application, a stamped and directed envelope, in order to ensure a reply. When this precaution is not taken, the non-receipt of a reply within reasonable time can only intimate that the article in question is disposed of, or that the proposal made is declined.*

606. **Small Dynamo or Electric Motor.**—Set of Castings, consisting of field magnets and bobbins, solid brass bed-plate, armature, with caps and spindle. Very easy to put together. Complete for 5s. (*Manchester.*)

607. **Small Pistol**, will go in waistcoat pocket, nickel plated, with 25 cartridges given in. Will sell for 6s. (*Manchester.*)

608. **Bench Lathe.**—3½ inch centre, 30-inch bed, all iron and steel, with hand rest, face plate, bell chuck, carriers, etc., and a few tools. Perfectly new, been made to order. Price £3, cash. (*Leeds.*)

609. **Taper Screw Chuck**, well made, never been used, fits half-inch Whitworth mandrel. Price 4s., post free. (*Paddington.*)

610. **Fifty-inch Bicycle**, roller bearings, cradle spring, L. D. saddle. £3 10s. (*Rotherham.*)

611. **Hand Dynamo**, castings for, complete, with silk and cotton covered copper wire. £1 1s. (*Rotherham.*)

612. **Treadle Fret Machine**, offered at 11s. 6d. (*Rotherham.*)

613. **Photographic Apparatus.** — (1) Quarter-plate portrait lens, with stops, 8s. 6d.; (2) ½-plate portrait lens, with diaphragms £2 2s.; (3) Camera and lens for taking 12 Gem Portraits on ½-plate, new, £2 2s. (*Rotherham.*)

614. **Anvil**, new, suitable for amateur. Offered at 12s. 6d. (*Rotherham.*)

615. **Square Piano**, suit learner. £4 4s. (*Rotherham*)

616. **English Mechanic**, 20 vols., unbound. £4. (*Rotherham.*)

617. **Books and Music.** — (1) Twelve Songs or Piano Pieces for 1s. 3d., post free. No Lists. (2) Fourteen Song Books, published at 1s. and 6d., for 2s. 6d., post free. (3) Magazines in parts—Blackwood's, 3 vols., 2s. 6d.; London Society, 2 vols., 2s.; The Quiver, 2 vols., 2s.; Science Gossip, 5 vols. in parts, 1875—79, inclusive, 7s. 6d. for the 5 vols. (*Stockton-on-Tees.*)

618. **Cassell's Popular Educator.**—Three vols. in monthly parts, complete. What offers, cash or exchange? (*Ossett.*)

619. **Mount Cutting.**—Patterns for cutting mounts in cardboard. Clean as new, 12 sizes, 8 patterns each size. Cost 24s. 4d., at Rowney's, Artists' Colourmen, *London.* Invoice sent. Sell 10s. 6d. cash, or exchange to 20s. in Photographic Apparatus, etc. (*Ashford, Kent.*)

620. **Horizontal Engine**, 4 inch bore, 7 inch stroke, governors, feed pump, flywheel, driving pulley; fit on cast-iron bed. In perfect working order, price £8, free by rail. (*Yorks.*)

621. **Flywheel, etc.**—(1) Heavy flywheel, 22 inches in diameter; would drive grindstone, 3s. (2) Large T-Rest Holder, 3s. (3) Celerite Hand-saw, new, 3s. 6d. Or will exchange for Fret-saw Machine. (*Bermondsey.*)

622. **Books, Various.**—For sale or exchange (1) AMATEUR WORK, Parts 1 to 35, inclusive, 10s.; (2) Harrison's Freighter's Guide, cost 5s., price 1s.; (3) Dislocations and Fractures, with Plates, cost 4s. 6d., price 1s.; (4) Young's Tradesman, cost 2s., price 6d.; (5) Black's Guide to Killarney, with Chart of Lakes, 6d; (6) Hartley's Principles of the Sciences, cost 4s. 6d., price 1s.; (7) Guide to Modelling, 6d. All bound and clean. (*Earlstown.*)

623. **Brass Cornet**, B Flat, by Butler, in good condition, complete, with crooks, etc. New twelve months ago; will sell for 15s., or exchange Pair of 3½ inch Iron Lathe Heads, or offers. (*Ramsgate.*)

624. **Moulding.**—Wanted, about a dozen yards of ½ inch Moulding, same as described by C. T. S., in page 306 of this Magazine. Price, carriage free? (*London, S.W.*)

*** Call on Henry Zilles, 14, *South Street, Finsbury, E.C.* He can show you some mouldings that may suit you.—ED.

625. **Siemens' Armature**, 6 in. by 2⅝ in., 16 sections, steel spindle. Patterns and core boxes for field magnets for same, and about 4 lbs. 18 and 20's double cotton covered wire. £1 the lot, worth £3. (*Manchester.*)

626. **Amateur's Lathe.**—4 inch centre, 1 5-speed pulley and flywheel, gut band, 13 brass chucks, 4 steel centres, face-plate, 2 carriers, rest and 2 tees, drills, boxwood chucks and screw chuck. On strong wood bed, 3 feet long. Price £5, a bargain. (*Manchester.*)

627. **Fancy Hard Wood**, Amateur's stock, comprising ebony, box, partridge, ringwood, satinwood, zebra wood, etc. Weight, about 30 lbs. Price 10s. the lot. (*Manchester.*)

628. **Fret-work Designs** on sale, cheap. (*Rochdale.*)

629. **Two Fifty-inch Tricycle Wheels**, steel spokes, brass flanged hubs screwed on gas tube, U rims, strongly made, quite new, suitable for crank machine. (*Hellingly.*)

630. **Amateur Mechanics**, Vols. I. and II., perfectly clean, and complete for binding, offered for AMATEUR WORK, Vols. I. and II., in same condition. (*Manchester.*)

631. **Organ Keys, etc.**—Wanted to purchase, in good condition, secondhand, a double set of Organ Keys, compass CC to G in alt. Keys about 18 inches in length, with or without frame. State lowest price. Will pay own carriage. Also, wanted set of 44 Dulciana or Small Open Diapason, in good condition. (*Wigan.*)

632. **Sewing Machine Stand**, polished pine table, size 2 ft. 6 in. by 1 ft. 6 in., and heavy flywheel, 15 in. in diameter, and small wheel with belt. Price 12s., or what exchange? (*Gateshead-on-Tyne.*)

633. **Black Ebony Walking Sticks.**—One large and beautifully carved, price 10s. 6d., or what exchange? and a smaller one, price 7s. 6d. (*Gateshead-on-Tyne.*)

634. **Booth's Mitre Machine**, cuts 4 in. moulding, cost 30s., nearly new. Will exchange. Bookbinder's or Joiner's Tools preferred. What offers? (*Manchester.*)

635. **English Mechanic**, Vols. XXXVII. and XL., unbound, will exchange for Vol. III., AMATEUR WORK. (*Huddersfield.*)

636. **Organ Pipes.** — Wanted, Dulciana, Keraulophon, Gemshorn, or Gamba, 8 ft., from G alt. to Middle C, or G below. Secondhand, but perfect, for cash. (*Ashby-de-la-Zouch.*)

637. **Fifty-two inch Bicycle.** — Cost £2 18s., will sell half-price. (*London, N.*)

638. **Violin, Case, and Bow.** — Cost £1 16s., will sell half price. (*London, N.*)

639. **Four-inch Lathe**, all iron, 2 ft. 6 in. planed bed. In good condition, will sell for 50s. (*Portsea.*)

640. **Organ**, 4 Stops, Open Diapason, Stop Diapason, Principal, and Fifteenth. 2½ octaves pedals, foot and hand blowers, ornamental front. Price £18. (*Bradford.*)

641. **Dexter C Scroll Saw Machine**, purchased from Messrs. C. Churchill and Co., for £3 5s., and only once used. In perfect order, with bevelling table, boring attachment, etc. Price £2 10s. (*Bagshot.*)

642. **Electric Bell**, 3 inch, with push, 5s. (*London, N.W.*)

643. **Case of Mathematical Instruments**, German silver mounted, 15s. (*London, N.W.*)

644. **Dissecting Instruments**, Two Cases, for botanical study or preparing objects for microscope. (*London, N.W.*)

645. **Spirit Levels**, Two, mounted on brass stands, 7s. 6d. and 15s. (*London, N.W.*)

646. **Photo Lens**, 3 inch, mounted. What offers? (*London, N.W.*)

647. **Electrical Machine**, 18 inch Plate. What offers? (*London, N.W.*)

648. **Photographic Apparatus**, 5 in. by 4 in. Camera and Lens, including portable dark chamber, glasses, chemicals, tripod stand, printing frames, baths, dishes, etc., etc., all like new. Will exchange for Engineer's Tools, or what offers? (*Great Yarmouth.*)

649. **Lathe**, 3 inch centre, back-geared, on high iron standards, complete, new. Will exchange for Engineer's Tools, or what offers? (*Great Yarmouth.*)

650. **Shooting or Fishing Punt.**—Mast, sail, and all accessories. Built last Christmas. What offers? (*Great Yarmouth.*)

651. **Forty-four inch Humber Tricycle.**—Bought last November, with lamp, alarm, and all accessories. What offers? (*Great Yarmouth.*)

652. **Lathe Fittings.** — Pair of 5½-inch Lathe Heads, and tee-rest: mandrel running in gun-metal bearings. In first-class order. 15s. (*Great Yarmouth.*)

653. **Cast-iron Fan**, 8 inch, complete, suitable for small forge. 12s. (*Great Yarmouth.*)

654. **Illustrated Serial Publications.**—(1) Familiar Wild Flowers, complete, 100 parts, clean and uncut as published; cost £2 10s.; (2) European Butterflies and Moths, in equally good condition; cost £1 10s. 9d. Open to all offers in exchange, no live stock. (*Portsmouth.*)

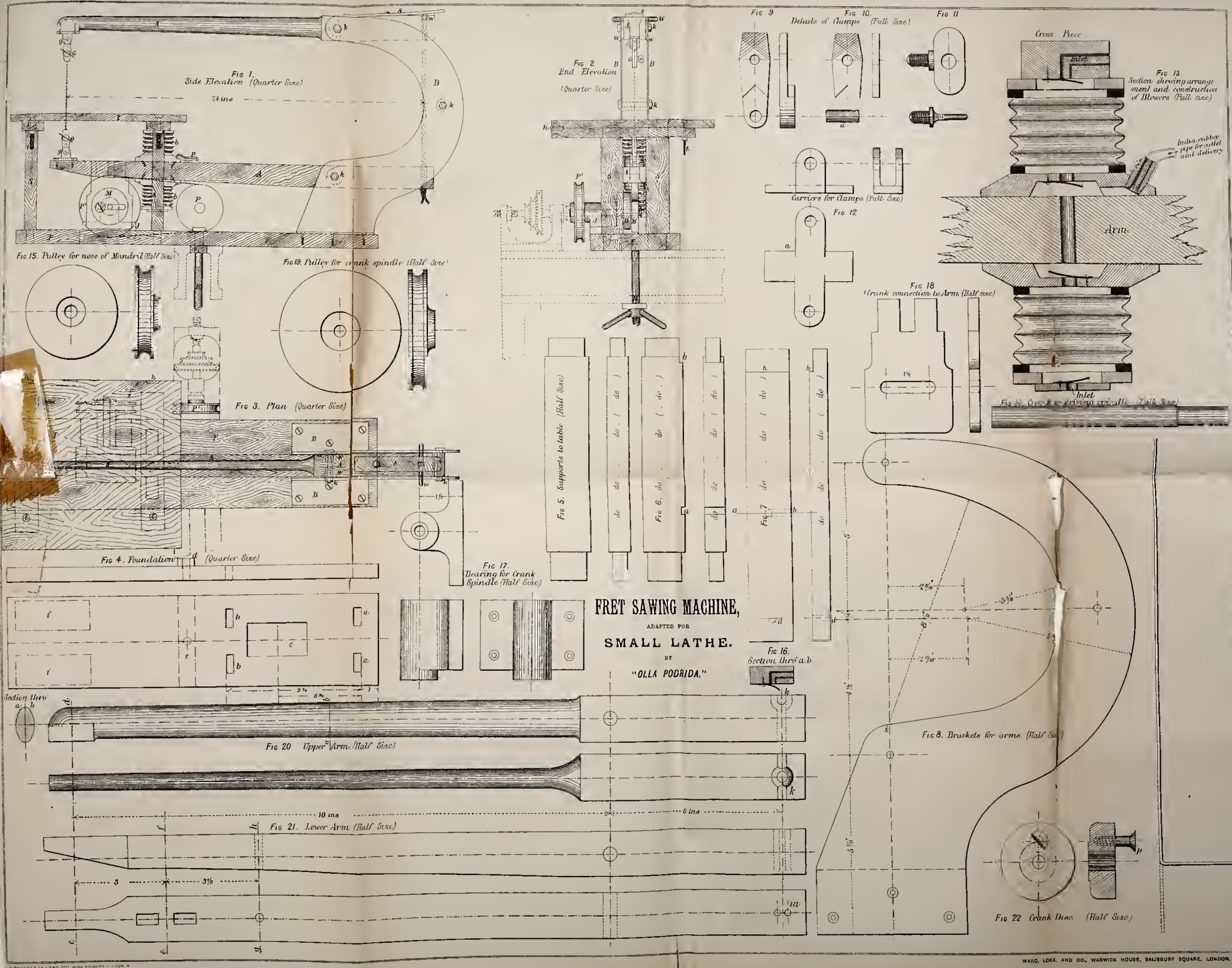
655. **English Mechanic.**—132 Nos., from Feb., 1883, to present date, clean and in good condition. What offers, cash or exchange? (*St. Austell.*)

656. **Fifty-four inch Bicycle**, electro-plated semi-racer, Aldous' ball bearings to both wheels, Arab cradle springs, L. and B. saddle, ivory handles, good condition, with King of the Road E.P. lamp, pouch, bell, spanners, etc. £10, complete. (*Basingstoke.*)

COMMUNICATIONS AWAITING REPLY.

Messrs. STANLEY & SUTTON; E. R. T. P.; S. M. L. (*Goderich, Canada*); A. F. S. (*Dresden*); TRANSVAAL; E. S. D.; J. G. G.; EDWARDUS; A COUNTRY AMATEUR; FENMAN; A READER FROM THE FIRST; T.W.H. (*Openshaw*); PITMAN; FLASHING DYNAMO; J. T. F.; F. R. G.; D. D. (*New Quay.*)

*** List closed July 28th.



FRET SAWING MACHINE,

ADAPTED FOR

SMALL LATHE.

BY

"OLLA PODRIDA."

WARD, LOCK AND CO., WARWICK HOUSE, SALISBURY SQUARE, LONDON, E.C.

A CHEMICAL LABORATORY FOR AMATEURS.

By P. CARMODY,
Of the Inland Revenue Laboratories, Somerset House.

II.—APPARATUS FOR THE LABORATORY.

OUR attention must next be directed to the necessary apparatus for our laboratory. Glass is indispensable, and as it is not practicable for an amateur to make it, it must be bought. The following articles should therefore be obtained from a dealer in chemical apparatus :—

Glass.—(1) Beakers, (2) test tubes, (3) funnels, (4) glass tube, (5) glass rod, (6) thistle funnel.

Porcelain. – (7) Basins.

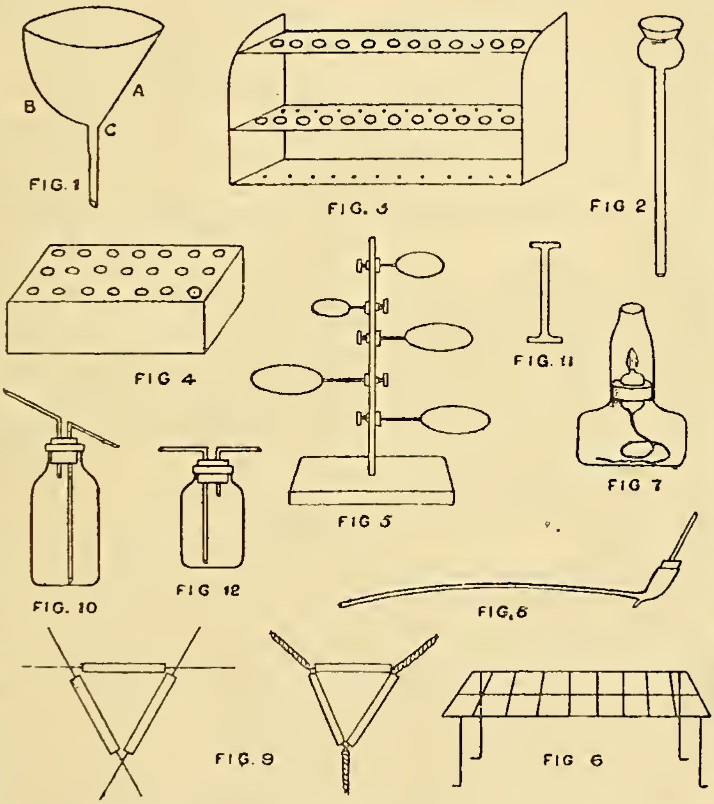


FIG. 1.—FUNNEL. FIG. 2.—THISTLE FUNNEL. FIG. 3.—TEST TUBE STAND. FIG. 4.—BOX AS TEST TUBE STAND. FIG. 5.—RETORT STAND. FIG. 6.—SUBSTITUTE FOR RETORT STAND. FIG. 7.—SPIRIT LAMP. FIG. 8.—BLOWPIPE. FIG. 9.—TRIANGLES OF WIRE AND PIPE STEM. FIG. 10.—WASH BOTTLE. FIG. 11.—GLASS ROD FLATTENED AT ENDS. FIG. 12.—WOULFFE'S BOTTLE.

Beakers.—A set of three costs about 1s. They are not absolutely essential for qualitative analysis, as their place may be supplied by test tubes. Indeed, in some laboratories beakers are not provided. Large beakers are undoubtedly a mistake in the hands of young amateurs, who are apt to fill them with liquids, and thus not only lose time at their work, but become slovenly in their habits, and inaccurate and untrustworthy in their conclusions.

Test Tubes.—A convenient size is 5 inches by $\frac{5}{8}$ inch. These cost about 8d. a dozen, and one dozen will be sufficient to commence with. If, however, they cannot be easily replaced, it would be wiser to keep in reserve two or three dozens.

Funnels (Fig. 1).—Two glass funnels, a two-inch (2d.), and a three-inch (3d.), are necessary. Every student should aim at neatness from the beginning, and to that end he should (with a moistened triangular file) cut off the stems of his funnels in a slanting direction, as shown in Fig. 1, and not straight across. They should not be cut at a less distance than 2 inches from the neck, C. In purchasing funnels, choose those with straight sides as A, and not hollowed or bent like B.

Glass Tubes.—Buy $\frac{1}{2}$ lb. of assorted sizes—$\frac{3}{16}$ inch to $\frac{1}{4}$ inch are useful.

Glass Rod.—$\frac{1}{4}$ lb. will be found to be ample. The price of both rod and tube is 1s. per lb.

Thistle Funnels (Fig. 2).—Three eight-inch long, and costing 2d. each, are enough. A thistle funnel consists of a piece of glass tube from 8 inches to 18 inches long, one end of which is expanded into a funnel. See Fig. 2.

Porcelain Basins.—Three are sufficient. Two and a half inches diameter is a convenient size and price. Best quality with spout, cost about 4d. each.

With this preliminary stock of glass, costing altogether about 5s., we shall be able to dispense with some of the more expensive apparatus.

Other things which must be bought are — A small set (3) of cork borers, with rod, 1s.; Platinum wire (about 6 inches), 6d.; Platinum foil (2 inches by 1 inch), 1s. Filter papers, 100 ($4\frac{1}{2}$ inches diameter), 5d.; India rubber tubing ($\frac{3}{8}$ inch bore), 2 feet, 1s. 4d.; Corks, assorted sizes (half gross), 1s.; Triangular file, 4d.; Round ditto, 5d.; Iron tongs, 1s.; Test papers, 6d.; Sponge, 3d.

The following are convenient, although they are not essential :—A 20 oz. wash bottle, 9d.; a 4 inch porcelain mortar and pestle, 1s.; Woulffe's bottle, 2 necks, 1s.; Test tube brush, 2d.

The following articles can be easily made in the

manner described below by any painstaking amateur :—A test tube stand, a retort stand, a gas burner, a blowpipe, a spirit lamp, triangles.

Test Tube Stand (Fig. 3).—Take three thin strips of good hard wood, not liable to split, about 12 inches long and $\frac{1}{8}$ inch thick ; two of the pieces $2\frac{1}{2}$ inches wide, the other about $1\frac{1}{2}$ inch ; with a brace and bit cut a number of holes in the $1\frac{1}{2}$ inch strip, and another set of holes close to the edge of one of the other two strips. Make the holes large enough to admit the test tubes, or say about $\frac{3}{4}$ inch diameter. Place the narrow strip on the perforated wide strip, the holes in the former being placed on the side away from the holes in the latter ; place the unperforated strip under the perforated wide one, and while the three are in this position mark the centre of the holes on each strip below, viz., on the second and third strips. Make at these centres a small excavation with a gouge, or make a small hole with a bit to permit the ends of the test tubes to rest there without falling through.

Now join the three pieces together in the same order, viz., the narrow strip uppermost, the perforated wide strip in the middle, and the unperforated strip below, by means of two upright pieces of thin wood, keeping the horizontal pieces about 3 inches apart. The stand will then be complete. Or get a flat box with sides about 3 inches high, nail down the lid, then, with a brace and bit, pierce the top or bottom as directed above. This makes a clumsy but a serviceable and cheap test tube stand. Its shape and construction are shown in Fig. 4.

Retort Stand (Fig. 5).—These are made of iron, and the cheapest cost about one shilling. The base may, however, be of wood about 1 inch thick, and 12 inches long by 4 inches wide. Through the middle of this bore a hole large enough to admit a round iron bolt. The bolt may be about 12 inches long, and should be fastened securely to the base-board by a nut. The rings must be of iron, and as they are made to slide up and down the rod, and fastened thereto in required positions by a screw, their construction will be beyond the reach of amateurs who are not provided with the necessary tools. They can be bought for a few pence each. For hard work and long service iron rings are superior to brass, but for ordinary purposes the latter answer very well. Care should be taken to purchase rings that will fit the rod of the stand, and those with a long plate of metal opposite the screw are firmer than those without for obvious reasons.

The following will be found a serviceable substitute for the above, and can be made by any one. Bend a flat piece of iron as shown in Fig. 6, attach an iron leg near each of the four corners, divide it medially and longitudinally by a similar flat piece of iron, or a strong iron wire, and transversely by several short lengths of wire, as shown in the sketch. This can be used for holding funnels, for basins while being heated over a flame, and for other purposes.

Gas Burner.—The cheapest of Bunsen's burners cost one shilling each, and if gas is used it may be cheaper to buy than to make one. Once seen, their construction is simple enough, although difficult to understand when described. A spirit lamp will doubtless be most used by amateurs.

Spirit Lamp (Fig. 7).—Take any ordinary bottle holding about a cupful of liquid. The nearer the neck is to the bottom the better. Fit it nicely with a cork, bore a hole through the cork with the cork-borers, fit into this a piece of glass or tin tubing long enough to extend beyond the cork on both sides, through the tubing pass as much wick as can be done conveniently, nearly fill the bottle with methylated spirit (price about 3s. a gallon), and as soon as the spirit rises to the top of the wick apply a light. When not in use the wick should be covered with a nicely fitting metal cap. This lamp is not intended to be more than a suggestion to my readers. It has faults of some magnitude. Glass tubing cracks, and metal tubing becomes dangerously hot. The longer the tube the less danger of the spirit taking fire. But my readers will soon find means of preventing accidents of this kind.

Blowpipe (Fig. 8).—The blowpipe is of many different forms, the cheapest costing about 6d. I have made a very serviceable one at a cost of one penny ; and as it is my desire that my readers should constantly direct their attention to the construction of cheap apparatus, I introduce a notice of it here only to show what common things may be turned to use in the laboratory. The drawing, Fig. 8, will need no description ; it is intended to represent an article probably well-known even to amateurs. Suffice it to say that it is made of clay, and of the long-stemmed sort ; about 3 inches of the end of this stem is broken off, and passed through a cork fitting accurately into the bowl. The larger the bowl and the smaller the hole through the stem, the better. But if the point be fitted with a metal cap, having a very small aperture at the point, it will remedy whatever other defects the instrument may have. Other improvements will readily suggest themselves.

Triangles (Fig. 9).—These are as useful as they are easily made. Take three pieces of thin wire each about 6 inches long, and three pieces of pipe stem each about 3 inches long ; run the stems on the wires, bringing the ends of the stems together in the form of a triangle, then twist each pair of wires at the angles, and the triangle will be complete. They are used for holding basins over flames, for holding funnels, etc.,

on apertures too large to otherwise admit of a resting place.

Wash Bottle (Fig. 10).—This may be made from any ordinary bottle with a wide mouth. Having chosen a bottle, fit it accurately with a sound cork. Pierce the cork with two holes; bend two pieces of glass tubing to imitate those represented in Fig. 10, and pass through the cork into the positions shown. Draw out the end of the tube through which the water is to be discharged, to a fine point. To cut tubing scratch firmly across with a moistened file, grasp the tube at both sides of this scratch and gently bend. The broken ends are sometimes jagged, and should then be rubbed down with the file, or, better still, held in a flame till they begin to melt. To bend glass tubing heat about 2 inches of it in a flame—gas or lamp—turning the glass all the time to distribute the heat uniformly. When sufficiently heated the glass will bend of itself, and the operator should simply direct the bending without the application of force. To draw out to a fine point heat as for bending, and as the glass softens pull gently apart until it breaks. Two points are thus made at one operation. Cut them of the length required with a file, and if the aperture happens to be too large heat in the flame until it closes sufficiently. It is better, however, to cut it in the proper place, and to use the flame as little as possible.

Mortar and Pestle.—These are rarely required. A thick piece of glass rod melted in the blowpipe flame till quite red, and pressed gently on a metal surface will make a substitute for a pestle for gentle crushings, and an ordinary basin will serve for a mortar. Fig. 11 shows how glass rods are flattened for this purpose. All glass rods that are used for stirring should, after being cut, have their ends rounded in the flame, or covered with a small piece of india rubber tubing about ½ inch long.

Woulffe's Bottle.—Fig. 12 made after the fashion of the wash bottle, described above, will serve as a Woulffe's bottle. It is used for washing gases.

Test Tube Cleaner.—Pass a piece of rubber tubing on to the end of a glass rod. This will clean test tubes or beakers better than any of the cleaners sold in the shops.

Now although I have described many pieces of apparatus, my advice is not to purchase all at once, but select as many as will be required for the immediate operations which it is intended to perform. For general analytical work all will be more or less necessary, but for special work only a very few may be wanted. In the description of the method of examination of each substance the necessary apparatus will be mentioned.

(*To be continued*).

A FIRE-SCREEN.

By PITCHPINE.

IN page 163 of this volume I gave some instructions for making window-screens of fret-work. In making one of these it occurred to me that by a similar method a very good screen might be made for another purpose. In this paper I propose to show how I utilized fret-work in the ornamentation of a fire-screen.

Unlike the window-screen, which was for the purpose of shutting out the too inquisitive gaze of curious people, the fire-screen is intended to check the too ardent advances of a pleasant friend, and as he will take an ell if you give him an inch, fretwork by itself presents too many openings of which he would take prompt advantage. It can therefore only be used round the edge, while the central panel, or main body of the screen, must be made of some material that will more effectually check the passage of the heat rays. For this purpose a piece of good cretonne of artistic design makes a very suitable panel. A piece of painted silk or satin will do better still if you can manage the painting, or get some one to do it for you; but before you accept any offer to supply this want, be sure of your man (or woman). You should know beforehand what sort of painting you are likely to get, or you may find yourself in a fix. If you close with the offer, only to find, when the panel comes to hand, that you have got a wretched daub, you will find some difficulty in backing out of the position with dignity. You must either fling sentiment to the winds and boldly declare the painting worthless, and so make a deadly enemy of the giver, or you must sacrifice your screen on the altar of friendship, and as soon as you decently can, consign it to the lumber room. A piece of cretonne, which you may purchase nowadays, of really artistic design, and at a wonderfully low price, will not play you this trick; and I can testify that it will make a very handsome and satisfactory panel if judiciously selected. Those designs in imitation of tapestry work will be found most suitable, or some design in which there is no geometrical arrangement of the pattern, as, for instance, where flowers and foliage are treated naturally.

The framework should be constructed of some hard wood, and must be finished off in your very best manner, for an ornamental bit of furniture like the one under consideration, if roughly and carelessly finished off, is rather an eyesore than an ornament, and brings your workmanship into constant discredit. Oak, fumigated to a rich brown, or even left its natural colour with fretwork to match, makes a good frame, so does mahogany or ash ebonized, with the fretwork of light

wood in contrast to the frame. American walnut is also suitable, but not so easy to work, as in my hands I find it rather apt to splinter at the ends, and if this happens it of course spoils the piece you are working, which, if it is nearly finished, is, to say the least, annoying. If preferred, the framework might be light and the fretwork panels dark; but it is, of course, quite a matter of choice, unless you have a central panel all ready prepared for you, in which case the framework should be suitable to the tone of the panel.

Having decided upon the kind of wood you intend to use, square up the two outside uprights, A, A, Fig. 1, ¾ inch square in section, 2 ft. 7½ in. long, this includes the tenon at the bottom. In the same way square up two pieces for the inside uprights, B, B, Fig. 1, ¾ inch square, 2 ft. long, including the tenons at each end. Then square up the four cross-pieces ¾ inch square, 1 foot 9½ in. long, including tenons at each end. Two more pieces ¾ in. square, 9 or 10 in. long, will be required for the feet, as shown in the section, Fig. 2. Mark one surface of each of these pieces and keep that for the front, then proceed to work them as I shall describe, gauging from the front edge. Take the two outside uprights, and down the centre of the inner edge of each plough a groove ¼ inch wide and ¼ inch deep. This groove extends from the top of the upright to the point where the bottom cross-piece is tenoned into it. Such portion of the groove as the plough will not cut must be finished with the chisel. This section is shown in Fig. 6. The bottom cross-piece is also prepared to the same section, the groove being ploughed through the whole length. For the present, work all the others, except the pieces for the feet, to the section shown in Fig. 5—that is to say, a ¼ inch groove must be ploughed down two opposite edges, and remember to gauge both from the front or marked surface.

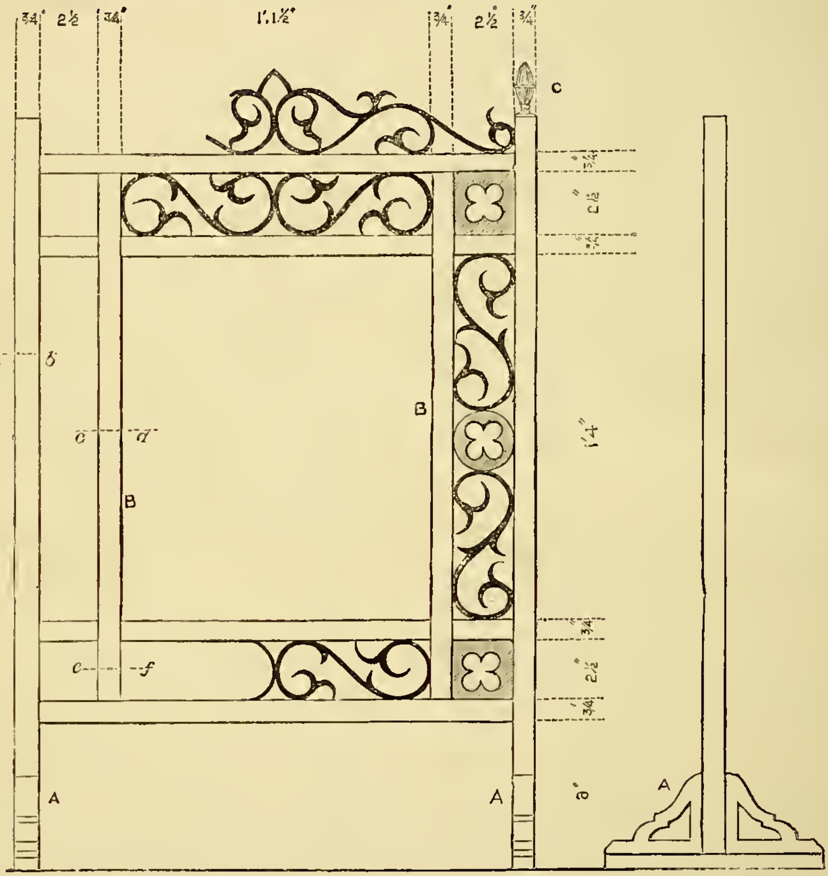


FIG. 1.—ELEVATION. Scale, 1½ in. to 1 foot.

FIG. 2.—SECTION.

Now do the mortising, and be very particular about the measurements, or you will find afterwards that your fretwork panels will not fit. At those points where the inner uprights cross the inner cross-pieces, they must be halved into each other. It is now necessary that the framework for the centre panel should be rebated all round like a picture frame. To do this take a sharp cutting gauge or chisel and cut away one side of the groove, making it in section like Fig. 7. Now take your framework apart and fit in the fretwork panels; see that they fit easily so as to allow the shoulders of the tenons to come close up and make a good joint, otherwise in clamping up you may split some of your panels. When all are fitted satisfactorily, glue and clamp up, using the square freely before the glue sets.

The framework is now ready for the centre panel. Make a frame of ¼ inch wood, ¾ inch wide, so that it will just fit into the rebate cut round the centre space. On each side of this frame stretch and fasten with tacks a piece of cretonne. The tacks must be so near the edge that when the panel is in position they may

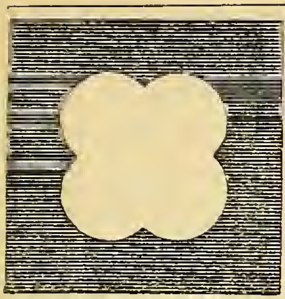


FIG. 4.—FRETWORK IN CORNER.—HALF SIZE.

FIG. 5. SECTION ON $e\ f$, FIG. I.

FIG 6. SECTION ON $a\ b$, FIG. I.

FIG. 7. SECTION ON $c\ d$, FIG. I.

FIGS. 5, 6, 7, ALL FULL SIZE.

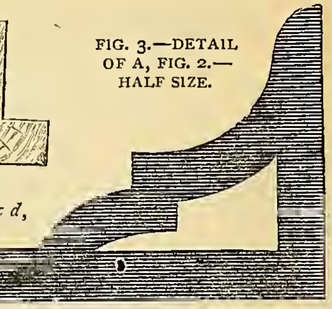


FIG. 3.—DETAIL OF A, FIG. 2.—HALF SIZE.

be hidden by the rebate. To keep it in position, and also to hide the tacks in the top surface, glue a $\frac{1}{4}$ inch strip of wood all round. This strip should be rounded on the top edge, and the best way to cut it is to square up the edge of a piece of wood of the requisite thickness, and then run a $\frac{1}{4}$ inch bead on it. Now cut off this bead, and you will have exactly what you want—viz., a $\frac{1}{4}$ inch strip of wood rounded on the top edge.

It only remains now to say a few words about the fretwork. The patterns given in Figs. 3, 4, 8, and 9 are half size, and these, as a matter of course, must be enlarged to full size, in order to form efficient working drawings. This done, it is easy to trace a complete pattern from the portions given in Figs. 8 and 9. In Fig. 8 the dotted line E F shows the centre of the pattern for the side panels, and G H the central line of the panels at top and bottom. In Fig. 9 the dotted line A B shows the central line of the scroll work at the top of the screen. To get the corresponding halves in each case, fold the paper back on these lines and trace the pattern. The fretwork should be of $\frac{1}{4}$ inch wood and must be very carefully cut. The corner pieces can be enlarged from Fig. 4: the quatrefoil ornament in this and Fig. 8 should have the edges bevelled with the carving chisel. The feet must be strengthened by pieces like Fig. 3, glued into the angles, as shown in Fig. 2. These pieces should be cut in $\frac{3}{4}$ inch wood, and the marks of the fret-saw carefully taken out with the file and sand-paper. The tops of the two outside uprights should be finished of with ornaments of wood or brass, as at C, Fig. I.

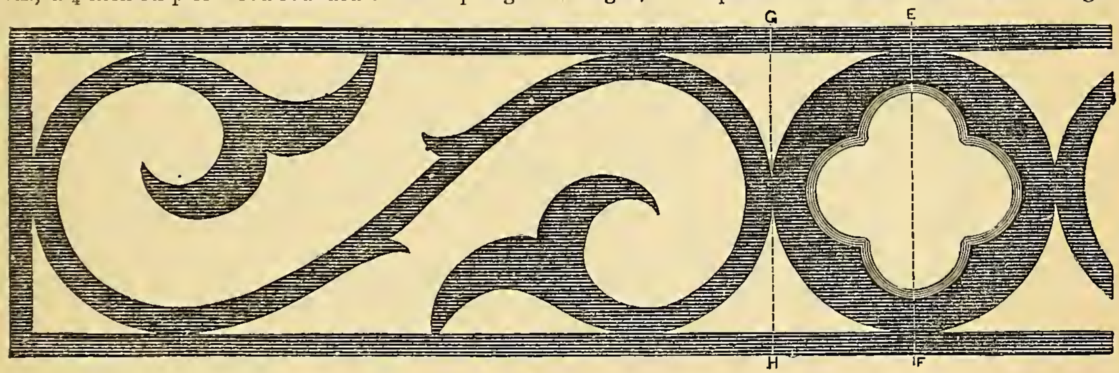


FIG. 8.—DETAIL OF SCROLL WORK AT TOP, BOTTOM, AND SIDE OF CENTRE PANEL.—HALF SIZE.

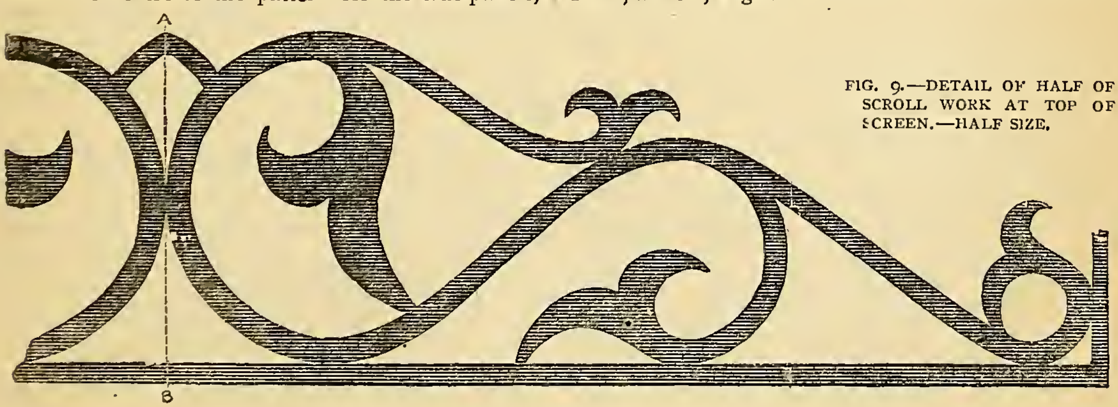


FIG. 9.—DETAIL OF HALF OF SCROLL WORK AT TOP OF SCREEN.—HALF SIZE.

LITHOGRAPHY FOR AMATEURS.

By H. E. GRANTHAM.

VII.—PULLING TRANSFERS FROM COPPER-PLATES, ETC., ETC.

THE art of pulling transfers from copper-plates to transfer to stone is so widely used, and of so great importance to the printer, that it is worth while to learn how it is done, as the printer has greatly increased facilities by its use. The printer will require the following articles: Scotch transfer paper; transfer ink, "plate to stone;" heater for warming the plates; best whiting (free from grit); coarse calico to form pads to wipe off ink from plate; and some sort of cloth to lay next plate when pulling transfers. I use some "tweed" remnants obtained from a tailor.

To Make the Transfer Paper.—The amateur can make quite as good transfer paper as he can buy, and the cost is then very small; the outlay for materials only being about a couple of shillings, even if he buys special paper to use for making it. Any decent printing paper will answer every purpose. Some of about 18 lbs. weight to the ream will be amply thick and heavy enough. It is much heavier when the composition is on.

To make the composition, get some of the finest plaster of Paris, such as is used for making plaster images, and put, say, half a pound into a good-sized basin, pour water into the basin, and mix with a wooden spoon, or something similar, to the consistency of cream. If left alone it will soon set hard, which must be prevented by constant stirring and the addition of a little water at intervals. Don't make it too thin, however, or the composition will not be tough enough. After about half an hour's stirring the setting quality will be killed, and it can be left while the paste is made. Take half a pound of flour, and make it into a tolerably stiff paste; pour into a good-sized saucepan to get hot, keep it stirred well, and let it boil for two or three minutes. Great care must be taken that it does not boil over, or the proportions of the paste and plaster will be spoilt. If it should boil over, it will be better to make a fresh lot of paste. Add the paste to the plaster, and mix well together, then tie a double thickness of straining cloth tightly round the top of another pan, and proceed to strain the composition from one into the other pan, by putting a little at a time on the top of the straining cloth and rubbing it through with the back of the spoon. The composition is now ready for spreading on the paper.

To Coat the Paper.—Put a few sheets of paper, say a dozen, on a board, and put a couple of nails in the corners to hold them and keep from shifting about. Put about two large tablespoonfuls of the composition into the centre of the paper, *i.e.*, that is two spoonfuls for each demy sheet, and with a broad flat camel hair brush spread it evenly over the whole surface, working first in one direction, and then at right angles to it; detach the sheet, and hang it up to dry as explained in making writing transfer paper. When all the paper is coated, or the composition is all used up, wash the pans and brushes, etc., etc., and put things away. If care is taken the brush will last many years. When the paper is quite dry, cut it to convenient sizes and "run through" the press on a rather warm stone. This will leave the surface nice and smooth. I prefer to warm the stone, but a cold one will do. The stone must be a polished one.

Transfer Ink, "plate to stone," is sold at about 6s. per lb. A quarter pound will be quite enough, and last a long time. It is in cakes, and a piece is cut off with a knife and wrapped in a bit of old calico or something of that sort, which acts as a strainer. How it is used will be described further on.

The Heater is simply a sort of iron box, inside of which a gas jet burns, so as to make the top hot; the plates are placed on the top of the box, and, of course, get warmed also. Some printers occasionally use the gas jet alone, but it is not to be recommended. It smokes the back of the plate. The bottom of the top of the box gets covered with soot from the burner, but there is no need to throw it away. If scraped off and kept in a small tin box with a cover, it can be used to make lampblack for illuminating, and such work.

A lump of good clean whiting will be needed to polish the plate, also a pad or two of coarse calico for cleaning ink off the plate. The pads are cut smaller than if used for a damping cloth, but they are used in a very similar way.

Supposing the printer wishes to pull a transfer from a "name plate." (This is a rather difficult subject for a first attempt, but I've selected it as being most likely to be in the printer's possession already.) First put a small stone into the press, and on the top place a rather thick card, on this place the plate, put a piece of the "tweed" over it, and then a couple of backings, one of which should be a card backing, then turn down the tympan, and get a fair printing pressure over the plate. Light the gas stove, and cut a piece of paper about the size of the plate, put the plate on the edge of the stove to get warm, and damp the paper just cut on the back with a small sponge. Take the plate in the left hand, holding it with a rag, or something to save burning the fingers, and the piece of transfer ink in the right hand; rub the ink backwards and forwards over the plate; the heat will melt the ink, and it will run through the cloth on to the plate. Continue rubbing till the work on the plate

appears quite full, then wipe it off with the "pad" of calico, working chiefly across the lines of the work so as to avoid taking ink *out* of the letters. The plate is cleaned with the calico till it looks fairly clean. It is then placed near the edge of a table, and the palm of the right hand is passed over the chalk or whiting, and thence lightly and quickly over the plate to polish it. The left hand acts as a "stop" for the plate. Care must be taken not to use too much chalk, as we printers often call it, or it will get into the letters. The plate is still pretty warm, and the palm of the right hand passes quickly over it towards the printer's body. The plate is turned about so as to get evenly polished. When it looks quite bright, place it on the stove, not too near the gas; give the "paper" another damping, put the plate on the top of the stone in the press, carefully drop the paper, composition side downwards, on the top of the plate, then place first the "tweed" and then the other backings, and run through twice with a steady, rather slow motion, so as to let the pressure soak in to the letters. On taking the backings off, the paper will be found adhering firmly to the plate. Gently warm the plate, and as the paper dries it will contract and lift off the plate of itself. On being examined it should appear bright and shiny like enamel paper. The work should be firm, clean, and quite full, but not smashed or heavy.

Faults.	Causes and Remedies.
The lines look weak and broken.	Too little pressure, or the plate not full of ink.
Some of the lines double at the end of the pull.	Generally caused by too much damping. Damp the paper less.
The paper does not look like enamel paper.	Plate not hot enough, or perhaps the paper not damp enough. Try the paper damper next time, if that does not do, warm the plate a little more.

The processes of laying the piece of transfer paper, and then of laying the backings over the whole, should be done as quickly as possible, or the heat of the plate will dry the paper. If the paper gets too dry, a good impression cannot be obtained. The required number of transfers having been pulled, the plate is cleaned by slightly warming it, dropping a little turps on and allowing it to remain till it has melted the ink left in the letters on the plate; the plate is then wiped clean with a rag, and finally polished with the whiting. It should then be wrapped up in a piece of paper to keep it from getting scratched, and put away in its proper place.

The "tweed" backings are liable to get hard from use, and damp absorbed from the damp paper; but if frequently dried on the stove, and well rubbed to keep them soft, they will last a long time. The transfers from copper-plates are nearly always mounted on a piece of paper, and damped in the "damp book." They require to be damp enough to slightly "kill" the glaze. If on transferring they do not stick to the stone, they are not damp enough. The method of transferring is exactly the same as for writing transfers, except that the pressure used is lighter, and the first backing laid over the transfer is wetted with the sponge and laid wet side downwards for the first three pulls, after that the back of the transfers is wetted as before described. The final "runs through" are with a pressure about as heavy as an "easy" printing pressure, but much depends both on the transfer ink and the paper: if the ink is very hard so as to require a very hot plate to melt it, the transfer will probably require a good pressure; if the ink should be soft it will be "smashed" with a heavy pressure, and must be transferred with an easy one. The transfers are soaked in water, and then carefully peeled off, and the composition is also carefully washed off with the sponge. The subsequent operations are similar to those described for a written transfer.

This and the preceding articles will, I think, afford nearly all the information that can be given on paper. To be able to turn out good work there is nothing but *practice*—and a good deal of practice too.

In concluding these articles, I may venture to express a hope that they will smooth away some of the difficulties the printer is sure to encounter. Should anyone find himself "in a hole" and will write full particulars of his case, I will gladly do my best to help him out. But, as I before said, it is often almost impossible to find out what *is* the cause of the work going "cranky." There is nothing else but to do as a doctor I once read of had the candour to say he would do with a patient, when he could not quite make out what ailed him.—"We'll try this, and we'll try that; we will shoot into the tree, and if anything falls, well and good."

ARRANGEMENT AND CONSTRUCTION OF A MEDICAL CABINET.

By NEPENTHE.

IT must be premised by one who would be as conscientious as competent to advise in the matter now to be discussed, that in no great concern common to humanity is it so true as in medicine that "circumstances alter cases." Many a man, by sensible inquiry into the *causes* of his ailment, and a wise provision against them, may be quite able to preserve

health and avoid medicine altogether, while others, whether by lack of comprehension or inherent vice of constitution, seem hardly to regain their equilibrium even with its aid.

The influences of climate, age, occupation, and mental states modify much the need of, selection, and doses of remedies, and variously, too, in individuals, so that it is only the quack who makes a "medicine for the million," "warranted to cure under any circumstances." Ours is an *art*, not yet a *science*, and while it possesses general principles of greatest value, these require the experience and personal knowledge of the skilful practitioner for their exact adaptation to the idiosyncrasies of the patient.

Nevertheless, there are confessedly circumstances where limited knowledge, and but a few remedies, *well understood* may serve—*first*, to assist Nature in her attempts to prevent disorder from becoming disease; and, *second*, to relieve local or general pain during this process.

The choice of medicinal agents for these purposes must be determined by the elements of safety, ease of comprehension, efficiency, and bulk.

FIG. 2.—"TWENTY-FOUR PILL BOTTLE," SHOWING EXACT SIZE, WITH CORK CAPPED WITH VEGETABLE IVORY.

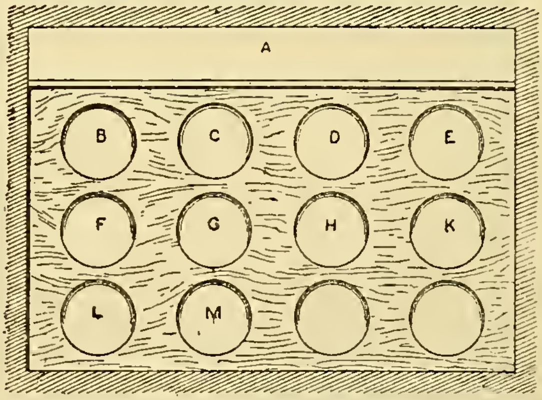


FIG. 3.—PLAN OF INTERIOR OF CABINET, WITH LABELS. A, Rigollot's Mustard Leaves; B, Rhubarb; C, Aperient; D, Alterative; E, Tonic; F, Aconite; G, Dover's; H, Nervine; K, Throat Tablets; L, Toothache (not to be swallowed); M, Cordial.

If one is to travel, his medicines must be so arranged as not to deteriorate readily, nor to injure clothing if packages be damaged or broken. Where *feasible*, then, I prefer the pill form, coated if may be, and contained in tightly-corked bottles. The latter may be obtained of any chemist, that known as the "*twenty-four pill bottle*," with cork headed by vegetable ivory, being of convenient size and shape. Twelve of these may be readily enclosed in a box measuring *inside* 5½ in. by 3⅝ in. by 3¼ in., leaving room for some other conveniences as well. The box may be made of mahogany ¼ inch thick, and entirely closed, the top being afterward sawn off to gauge, ensuring exact fit. Three-quarter inch depth is allowed for the lid, which should be fitted with hinges *screwed on*, *not pinned*, and with a good lock. It is well to round the corners slightly, and finish with French polish or oil. One inch from the bottom should be fastened a diaphragm or tray, perforated as shown, so that the bottles may be kept apart. Begin with a half-inch piece of mahogany, work the holes from both sides with a ⅞-inch Jenning's centrebit, and plane down to a quarter inch afterward. Fit the tray in the front of the box, leaving five-eighths of an inch of area in rear for a tin package of Rigollot's mustard leaves, as shown. Each bottle should be encircled by a well-gummed label, placed so that it can not be marred by friction of the tray, and upon this should be written abbreviated directions. A name also, may be inscribed upon each ivory cork cover, as shown by lettering, in plan of perforated tray in Fig. 3.

Prefacing the description and directions for use of each remedy with a note of hygienic and precautionary measures, which will often be more efficient than medicine, I mention—

I.—REMEDIES FOR CONSTIPATION.

Remarks.—Observe a regular hour for the stool. *Go whether you have an inclination or not.* A lack of "moral courage" will be your chief obstacle to success. Go preferably *after a meal.* Take a glas of cold water upon retiring, and upon arising from bed. Eat sound fruit—apples, oranges, dates, or tamarinds — before or with breakfast.

Medicines.—Chew and swallow a bit of "selected rhubarb root" as large as a bean, after each meal. If insufficient, take one "*Aperient Pill, English*" (made by Schieffelin, and to be had of Allen and Hanbury, *Plough Court, E.C.*), on rising, and it will *commonly* operate before noon. It may be repeated each day in case of failure, but *dependence* upon this class of remedies is always to be deprecated.

II.—FOR DIARRHŒA.

Remarks.—Inspect the passages to determine their nature, and the *cause*, if possible. If "bilious" in character, they will be of yellowish or yellowish-brown colour, and more or less offensive in odour. Avoid *religiously* any food that may be discerned in the stools as undigested, and, in general, all fruits having shiny skins and hard seeds. (*Never* swallow

a grape stone or cherry pit.) Eschew vegetables for the present. Live for the most part upon milk (with or without hot water, which always adds to its digestibility), porridges made of milk with *wheaten* or rice flour (*not oaten*), beef-tea from *Liebig's Extract of Meat* or *Valentine's Meat Juice.* Tea or coffee with a dessert-spoonful of brandy in each cupful are useful. Wear a woollen bandage around the body, which may be folded once, a tape run through the fold, the centre applied to the navel, and ends brought across the back to tie in front. Take a recumbent posture whenever it is possible. It is useful in many forms of illness, and absolutely necessary in some to do this.

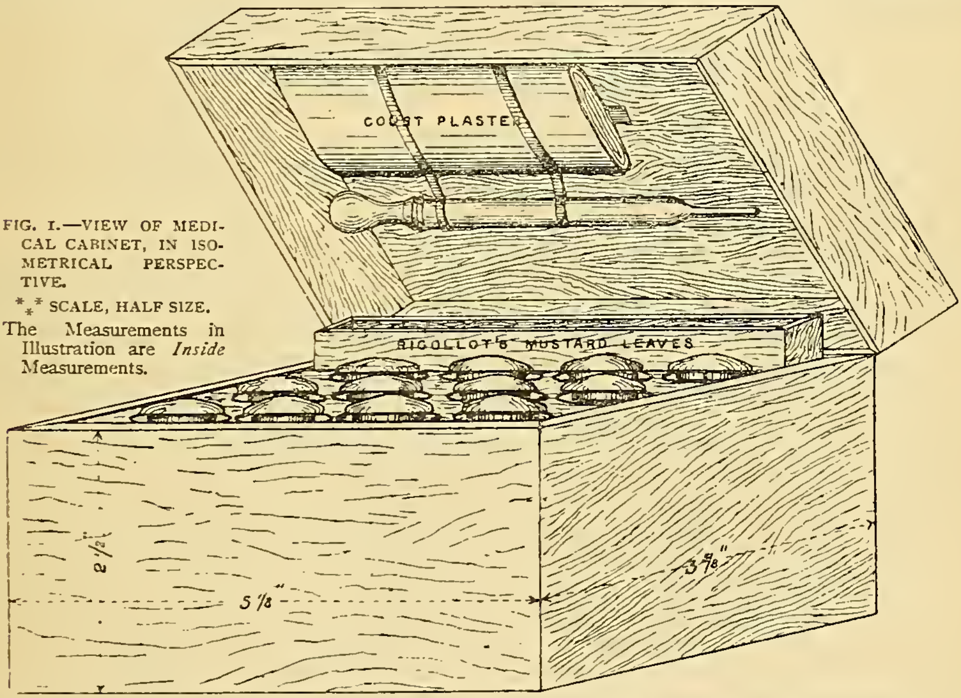


FIG. I.—VIEW OF MEDICAL CABINET, IN ISOMETRICAL PERSPECTIVE.

*** SCALE, HALF SIZE.

The Measurements in Illustration are *Inside* Measurements.

Medicines.—When undigested food is being passed, take the "bit" of rhubarb thrice daily till it is no longer observed in the stools. If diarrhœa persist, take one pill of "*Dover's*" (Schieffelin's, 2-*grain*; Allen and Hanbury, *Plough Court*, *E.C.*) after each movement, till checked.

III.—For Dysentery.

Remarks.—The stools are scanty, mixed with or consisting entirely of phlegmy masses of mucus, more or less bloody, and nearly odourless. Pain is severe, and experienced mainly at anus, with desire to strain and remain long at stool. Rest and warmth, in *recumbency*, is now *absolutely* requisite, and must be continued until passages have ceased for twenty-four hours. Relapse is common, and always dangerous.

Medicines.—When the onset is sudden, preceded by constipation, nothing is better than an ounce of *castor oil at once* (taken with hot coffee or a mouthful of lemon juice) to ensure the rapid removal of offending matters from the bowels. Sometimes it is sufficient alone to put an end to symptoms. But if the attack has come on *gradually*, take one "*Alterative*" (made after the appended formula by any good chemist) pill, and one "*Dover's*" pill, together, every hour, till bile reappears in the stools (known by its odour and colour); then *omit the* "*Alterative*," continuing "*Dover's*" at increasing intervals of two, three, or four hours, till pain and passages have been checked. (Formula for "*Alterative*":—*Calomel* and *Piperine*, *of each five grains*, to be mixed and made into twenty as small pills as possible, "according to rules of art.")

IV.—For Cholera Morbus and Cholera.

Remarks.—Stools often profuse, watery, colourless or like dirty water, and without normal biliary odour. Absence of pain lulls suspicion. Nausea and vomiting often attend the passages, with cramps in the legs and feet. Recumbency in woollen blankets, artificial heat applied by hot water bottles, wrapped and placed along the body and between limbs, with "mustard leaves" over the whole abdomen, chest, and along the entire spine, are essential aids. Valentine's Meat Juice or Liebig's Extract, made into beef tea,—milk and hot water and brandy (two parts of the first two,

and one part of last), mixed, may be given in tablespoonful quantities every five or ten minutes, *irrespective of vomiting.* Fresh air must be freely admitted, but no draughts allowed when the patient is at stool. All passages to be disinfected by mixture with a tablespoonful of *chloride of lime*, and instantly removed from the room. Send for the most skilful physician within reach *without delay.*

Medicines.—One "*Alterative*" pill *every half hour* if discharges are constant, or every *two, three, or four hours* if occurring only *once in such an interval*, till biliary matters appear, like little yellowish-drab "floating islands," upon the surface of the stools. Then omit the pill. *Never tamper with opiates, nor use them unless under advice.**

V.—For Sea-Sickness and Kindred Nausea.

Remarks.—There is no "specific" cure. Fresh air, deck freedom from ship-smells, a recumbent posture, and nutritive food are essential. Valentine's Meat Juice or Liebig's Extract, being free from grease, are most acceptable, and are best taken in dessertspoonful quantities of the beef tea often. Iced champagne, or teaspoonfuls of brandy with little water, sometimes serve well.

Medicine.—Take five or ten drops of the "*Cordial*" in a wineglassful of *iced water*, sipping it during a half hour. The "Cordial" is made by mixing *equal parts* of the *Aromatic Spirits* of *Ammonia* and a *ten per cent.* solution of *Pure Chloroform* in *Rectified Spirits of Wine.* It soothes the irritated stomach, and neutralizes its excess of acidity. The "dropper" shown in the lid of Cabinet should always be used when preparing the dose. In debility from long-continued sea-sickness, the "*Tonic*" pill described in the following section will be found efficacious.

VI.—For Indigestion.

Remarks.—Favour the stomach by avoiding the cause when known. Regulate the bowels, and eat at accustomed hours only. Avoid fruits, vegetables, and very sour condiments.

Medicines.—Take the "Tonic" pill of *Quinia, Phosphorus*, and *Nux Vomica*, one before each meal. It restores appetite as well, but may not suit plethoric habits. (Procure the "Schieffelin" pill of Allen and Hanbury.)

VII.—For Feverish Colds.

Remarks.—Undo the cause by opening the skin's pores in a hot bath prolonged for twenty minutes, and followed by quick cold sponging and frictions.

Medicine.—A "parvule" of *Aconite* (Warner's, procurable at Newbery's, 1, *King Edward Street, Newgate*), $\frac{1}{20}$ grain, *every half hour*, till pains in head and limbs are relieved, and skin is cool and moist. Time is an essential element.

VIII.—For Sore Throat.

Remarks.—The same hygiene is appropriate.

Medicine.—One "parvule" of *Aconite* as above, with same limitations. For local use, one "*Compressed Tablet of Chloride of Ammonium and Borax*" (Wyeth's, procurable at Burroughs, Wellcome, and Company's, *Snow Hill Buildings, Holborn Viaduct*), to be dissolved at back of mouth every hour or two. It is very *salty*, but very efficient.

IX.—For Cough and Hoarseness.

Remarks.—The same hygiene if feverish.

Medicine.—A "tablet" of the "*Chloride of Ammonium*," above mentioned, every two to four hours. With every alternate one take a pill of "*Dover's*" (Section II.)

X.—For Headache.

Remarks.—Causes are multifarious, *e.g.*, constipation, indigestion, nervous excitement and fatigue, and are often periodic and hereditary. Treat the *cause*, if known and manageable.

Medicines.—In *nervous* form, take one pill of the "*Nervine*" sort, once in three or four hours. These may be made by any good chemist thus:—Mix twenty grains of *Oxide of Zinc* and forty grains of *Caffeine* (the Citrate of Caffeine is preferable), "according to art," to make twenty pills, as small as possible. These often palliate very much the periodic and hereditary sort called "sick headaches." For the feverish and congested forms, where both eyeballs are painful and the eye dreads light, take a "parvule" of *Aconite* (Section VII.) every hour or two. For stomachic or intestinal kinds, take an "*Aperient*" pill.

XI.—For Toothache.

Apply to the cavity, or between the teeth, upon "absorbent" cotton, three to five drops of the "Toothache" mixture. (It may be held *by a parent* against the painful tooth of a child, but *must not*, in such a case, *be left in the mouth.*) Repeat every half hour.

It is thus made:—Mix and dissolve two grains of *Carbolic Acid*, with half a drachm of *Tincture of Aconite Root*, half a drachm of *Tincture of Opium*, five drops of *Oil of Cloves*, and one drachm of *Glycerine.*

XII.—For Colic.

Remarks.—If sudden, and not more than three hours after a hearty meal, empty the stomach by vomiting. Try thrusting the finger into the back of the throat, a glass of warm water with a teaspoonful

* This advice is based upon personal experience in epidemics, where it was clear that many lost their lives from use of heavily-opiated "Cholera Mixtures," while nine-tenths treated as above recovered. Corroborative evidence may be found in the address of Dr. George Johnson to the Royal Medical and Chirurgical Society (*Lancet* of March 28th, 1885, page 563, and letter of Dr. Johnson Martin printed in the *Lancet* of August 23rd, 1885, page 345. Pages might be written on this topic.

of mustard stirred in it, or, finally, if unsuccessful, send for twenty grains of powdered *Ipecacuanha*, to be taken as was the mustard.

Medicines.—Take ten drops of the "*Cordial*" in a wine glass of *hot water* every ten minutes, till relieved (Section V.). With every third dose a pill of "*Dover's*" may be taken, extending intervals as relief is obtained. A mustard leaf (Rigollot's) applied over the seat of pain, and worn *till the skin is highly reddened*, is *invaluable.*

Two bottles remain for any favourite remedies the owner may choose. A few layers of "absorbent" cotton, the "dropper" mentioned, and a case of court plaster fastened by elastic bands into the front of the lid, will complete what it is hoped may be found a very useful outfit.

A SHORT CHAPTER ON SCREWS AND SCREW CUTTING.

By JAMES LUKIN.

TO be able to cut a screw with accuracy is a common object of ambition with amateur turners, and it is indeed a very worthy object, no appliance being so handy for connecting parts of turned work. A box with a screwed cover is infinitely better than one made without it. An ornamental structure of many component pieces is much less likely to be satisfactory if it is built up by the aid of glue. The screw is, in fact, a turner's bond of union, and the art of making it should be cultivated with assiduity until the requisite skill has been attained.

There are various methods of tracing screws, but not one so satisfactory as simple hand-work, except for screws in metal, for which it is only suitable to a very limited degree. But hand-work is confessedly uncertain in its results, and is affected by causes, over which, it may truly be said, the learner has no control. A many pointed tool is put into his hands, and he is told that he must traverse it at a certain rate in a horizontal line, while the work is in rotation, when it will cut a screw. But at what rate is it to travel? Just so fast, and not a shade faster, as shall cause the second tooth to fall into the track of the first in one revolution of the work; that is to say, the tool must traverse a distance equal to that between any two adjacent threads, while the work revolves once. The actual speed therefore depends not only on the fineness or coarseness of the pitch, but also upon the diameter of the work upon which the screw is to be cut. If, then, the learner has caught the knack of traversing a tool which will cut eight threads to the inch, it by no means follows that he will succeed with either a coarser or finer pitch. I think if the matter had been written down as I have now written it, and the question raised whether it were possible to traverse a tool at the exact rate required, the answer would have been in the negative—that no skill would enable a man to strike a thread of 20 pitch for instance, in which for each revolution of the work the tool must be evenly traversed just $\frac{1}{20}$ of an inch without variation. Yet in spite of a theoretical difficulty, amounting to apparent impossibility, this is done daily, even by lads who have not been many months at the lathe. There is a sort of hap-hazard at first, which may mean failure, but as a general rule, practice will enable a turner to acquire, within a moderate space of time, considerable proficiency in the art. At the same time, it is manifestly desirable that screw-cutting should never be a work of doubt or experiment which may possibly be unsuccessful, and consequently variously designed apparatus has been constructed to render the traverse of the tool a matter of certainty. Of these contrivances, some are necessarily, more or less, unwieldy—too complicated for the required purpose, say the tracing of half-a-dozen threads on a box, yet necessary, perhaps, for the next job in hand, which may be an accurate screw in metal several inches in length. It is, in fact, here that the difficulty occurs in planning the appliance in question. It should, if possible, be suited to all cases, because on all alike the traverse of a tool at a given rate is all that is required. But the practical application of an apparently simple theory presents difficulties which are by no means easy to overcome. The question to be solved is plainly this: The tool must traverse or the work at a given rate, and the choice between these must depend upon contingent circumstances, such as which is the simplest to carry out practically, and which will probably give the best results. Here the skilled and practised hand is the best machine, but is not always available. The next in simplicity is the traversing mandrel, which causes the work to traverse while the tool remains a fixture. It has its drawbacks, but they are comparatively few and unimportant, and are principally these two following:—

1. This arrangement copies the screws on a guide, upon which it would not be convenient to cut more than five or six pitches, and has no power to originate other pitches, which may possibly be desired.

2. It is of little use except for chucked work of limited length. Screws cannot therefore be cut on the end of work needing the support of the back poppit, which would prevent the traverse from taking place.

The advantages, on the other hand, are extremely great. There is no wheel gearing or cord attachment, and for the special purpose for which it is intended, no apparatus yet designed is equal to it. It is, in short,

for amateur requirements, all that can be desired. The costliness of the modern form precludes, nevertheless, its general use ; the older design, which was equally effective and much cheaper, having unfortunately disappeared from English lathe shops. An attempt is, however, about to be made by the Britannia Company to introduce a lathe of this class, sufficiently low priced for the countless throng of amateurs, whose purses have to be consulted rather than their wishes. There is little doubt that if a good lathe of the kind was introduced at a moderate price, it would be of almost universal adoption as supplying a very pressing need.

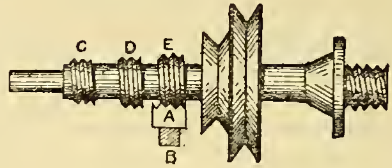


FIG. 1.—OLD STYLE OF TRAVERSING MANDREL.

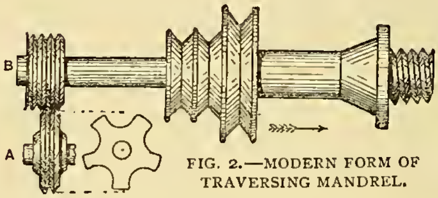
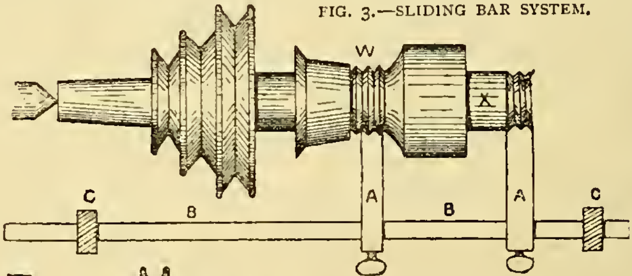


FIG. 2.—MODERN FORM OF TRAVERSING MANDREL.

There are two ways of constructing a traversing mandrel. The first and oldest plan was to cut about six guide pitches on the mandrel itself, which was made longer than that of the ordinary lathe, and a wooden block was pressed up by a wedge from below against the particular bit of guide screw which it was desired to reproduce upon the work. The mandrel was then set free to slide in its bearings, and, of course, travelled in a horizontal direction at such rate as the pitch of guide screw compelled it to assume. A single point tool clamped in the rest (often a very simple one) traced upon the work a screw of the desired pitch. Only an inch perhaps was done at a time, but this sufficed for a great deal of work, and it was easy afterwards by a hand chaser to extend the screw to any desired length, the difficulty of screw cutting being confined to the accurate starting of a thread. The only difference in the modern lathe is that instead of having guide pitches cut upon the mandrel itself, they are cut upon brass, steel, or gun-metal ferrules, which can be attached to the further end of the mandrel at pleasure, and which gear into a few threads cut in the edge of a scalloped disc, drawn up as needed by a screw or by an eccentric cam. If there are six ferrules, the disc has six of these scallops, each with a thread corresponding to one of the ferrules, and as the disc itself turns on a centre pin, either can be put into gear at pleasure. This is, of course, by far the neater plan of the two, besides which, when the ferrules are not in use, the mandrel beyond the headstock is clear for the attachment of certain ornamental apparatus of which the spiral is one of the chief. This can however just as easily retain its old place at the chuck end of the mandrel, where, indeed, until recently, it was always attached.

With a traversing mandrel thus arranged after either of the above plans, all difficulty in screw cutting ceases within the limits already stated, and these are such as to include nearly all the usual work of the amateur in wood, ivory, or brass ; the harder metals cannot so easily be cut in this way, as the apparatus is too delicate to bear the strain.

FIG. 3.—SLIDING BAR SYSTEM.



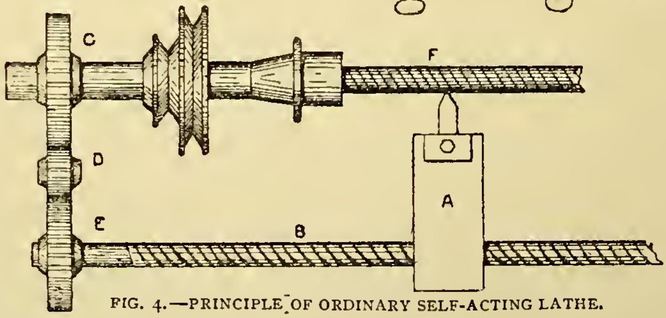


FIG. 4.—PRINCIPLE OF ORDINARY SELF-ACTING LATHE.

Many attempts have been made to give to the ordinary lathe the capabilities of one with a traversing mandrel, by fitting ferrules behind the pulley or upon the back of the chucks, and connecting them to the tool by an intermediate bar made to slide easily in bearings fixed in front of the lathe bed. One end of the bar carries upon an arm at right angles to it, the nut or half nut whose thread is a counterpart of the ferrule in use. The tool is clamped to a similar arm which is adjustable at any part of the bar, and may therefore be placed so as to act upon the work in hand, tracing a screw upon any desired part of it. The advantage of this plan is, that as the work does

not traverse endways, the support of the back poppit is available, and a screw can be cut upon the end of a rod mounted between centres. It is, of course, a copying apparatus, only capable of reproducing the pattern screw cut upon the ferrule. Notwithstanding some apparent advantages, I do not consider this apparatus in any way superior to the traversing mandrel. There are certain difficulties in its practical construction, and the sliding bar inseparable from it is rather in the way. Suppose, also, that we merely want to trace a few threads, as for instance, in a box cover—there is *too much of it*, it is not worth while to rig up so much to accomplish so little. And I have come almost invariably to the same conclusion respecting all contrivances that, from time to time, have come under my notice. To have to lift up and arrange a more or less heavy or elaborate apparatus to do what can be accomplished by hand in half the time, may do very well for amateurs, but no workman would look at it. The traversing mandrel, on the other hand, is always ready at a moment's notice. It takes up no room on the lathe bed. It can be thrown into gear in a few seconds. There are no levers or arms, or gear wheels or cords to get loose, the lathe bed is unencumbered, and the screw can be cut almost without possibility of failure

A contrivance exhibiting much ingenuity was invented by General Dumbleton a few years ago, of which no account has been given in these pages, and which is very little known, as it was never advertised. I will give a representation of it presently. In this the guide, or pattern screw, remains in the line of centres while the work is being done. It is about 4 inches long, and one end is held in a recess in the work while the other is supported on the point of the back poppit screw. The result is that the guide screw revolves with the work which is quietly pulled round by laying the hand on the mandrel pulley which must be slowly rotated. A nut fitted on the guide screw carries a revolving cutter by which the thread is cut, and which is driven at a great rate by the overhead apparatus. The thread can be completed at one traverse, and is very cleanly cut even in soft wood, upon which ordinary chasers act so badly. The result is perfect as far as it goes, and as there is no hurry, and as it is not necessary to keep the mandrel revolving at an even pace, the screw can be gently led up to a shoulder without fear of accident. The drawbacks in this case are that a recess must be turned in the end of the work, inside a box or its cover, to fit the toothed end of the guide screw. (It is, of course, cut away subsequently.) 2ndly, only work held in a chuck can be screwed; 3rdly, the lathe must be provided with an overhead; and, 4thly, it is only possible to cut inside screws upon such hollow work as will admit the revolving cutter—work averaging 1 inch inside diameter. Here again the traversing mandrel bears the palm, especially, as it is easy to arrange a revolving cutter carried by the slide-rest when soft wood is to be operated on; but, again, this tool which is in many respects very serviceable, costs about a guinea, and a traversing mandrel is about £10 dearer than an ordinary one.

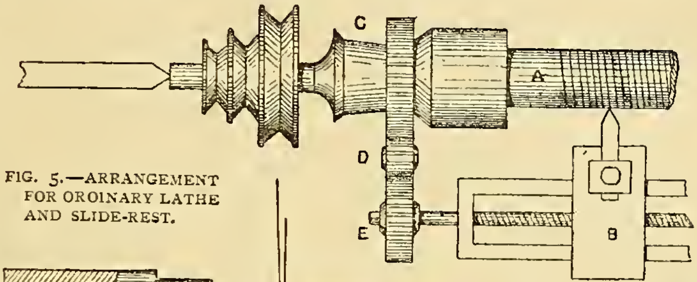


FIG. 5.—ARRANGEMENT FOR ORDINARY LATHE AND SLIDE-REST.

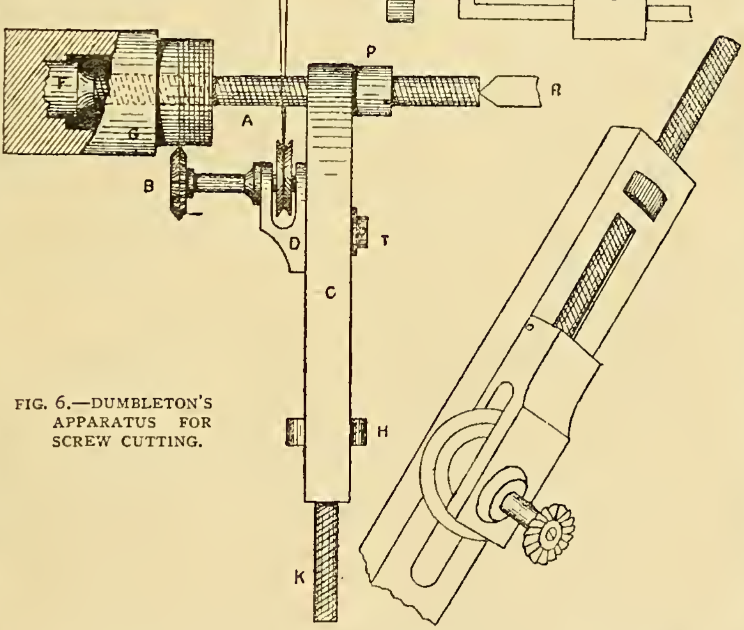


FIG. 6.—DUMBLETON'S APPARATUS FOR SCREW CUTTING.

I may observe here with regard to the principle of this apparatus that it rests upon the position of the guide or pattern screw. So long as this is kept in the

line of centres, and is made to form a continuation of the mandrel, all need of gearing by cords or wheels ceases. If the screw is removed from such position, in which it is almost of necessity more or less in the way, it must evidently be driven by connecting it with the mandrel or fly-wheel, necessitating cog-wheels, or cords. Let our readers try to plan screwing apparatus, and it will be found that all complication originates with this necessity. We now, therefore, have to consider those methods in which gearing of some kind is used ; and of these the most effective of all is the ordinary self-acting lathe. This will *originate* instead of *copying* screws, and is suitable for cutting them in metal of all kinds ; internal or external screws being produced with equal ease. The guide screw of this lathe extends generally the full length of the bed, and its rate of revolution, as compared with that of the mandrel, is regulated by variously sized cog-wheels here technically called "change-wheels." The tool is carried by a slide-rest traversing bodily along the lathe bed. This rest is driven by a divided nut, through which passes the guide or leading screw, the pitch of which by means of the change-wheels is transferred to the work doubled, halved, or otherwise proportioned as may be desired.

One other and similar mode of obtaining screws of various pitches is to make use of the screw of the ordinary slide-rest as the guide screw, and to gear this either by cords through the medium of an over-head, or by cog-wheels driven from the mandrel, or from a chuck upon which the first of the series can be temporarily fastened. I have thus passed in review all the various means of cutting screws in the lathe, chiefly that I may show the amateur the distinctive qualities of each, and may thereby give him certain fixed principles to guide him in his own choice, whether as an inventor or as a purchaser. The question in the latter case is seldom understood, the wish to "cut screws," being of a comprehensive character ; and the lathe suitable for doing this equally well on all materials has not yet been devised. But I may state, once for all, that unless metal turning and cutting screws upon iron is the main work to be taken up, the screw-cutting or self-acting lathe will only disappoint its possessor. In wood and ivory the only two wholly satisfactory processes are the simple hand-chasing tool and the traversing mandrel ; and if the latter be within reach of the amateur's purse, he will assuredly not regret the outlay. Setting this aside there is nothing comparable with the hand-chasing tool, and to gain the requisite skill is for the most part a question of resolute practice. The finer threads from 16 to the inch are the best to begin with, and I think, as a rule, 20 to the inch is about the easiest wherewith to learn the art.

The accompanying drawings, it must be understood, are merely illustrative of the various systems described, details of frames, etc., being wholly omitted; nor are the mandrels shown to be considered correct types of those which would probably be used. Fig. 1 is the old style, or German pattern of traversing mandrel, having the pattern screws C, D, E, cut upon it. A is one of the soft wood blocks pressed up by the wedge D. This block is quickly indented by the screw threads, and forms the half nut, compelling the mandrel to travel forward for a short distance at the rate of the screw pitch which is in use.

In Fig. 2, the modern form, the screw which is to form the pattern is cut outside a removable ferrule attached at B. Into this gears a half nut, formed by one of the scallops in the plate A, which turns on a centre pin. This pin is in the actual lathe attached to a vertical slide at the back of the poppit, allowing the plate to be raised by a cam till it gears with the ferrule on the mandrel. Fig. 3 shows the sliding bar system, B B being such a bar of round iron sliding in bearings C C. Upon it are fixed the horizontal arms A, A, one of which has a half-nut gearing with a guide screw, W, on the back of the chuck. The other arm carries a single point tool or a chasing tool, which will thus trace upon the work a copy of the guide screw. There are some other varieties of this arrangement, but as the principle is the same in all, I need not give details, especially as this is the only really simple arrangement, the rest necessitating gearing by cog-wheels.

Fig. 4 illustrates the principle of an ordinary self-acting lathe. B is the leading screw working in a nut attached to the saddle of the rest, A. The rate at which the latter travels along its bed depends on the sizes of change-wheels, C, D, E, which may be varied at pleasure. The stud-wheel, E, is carried on an arm, the centre of movement of which coincides with that of the mandrel. By raising or lowering it, in addition to the adjustment of the stud in a slot in the arm, the requisite distance between the wheels is preserved, so that any sized ones can be used. In Fig. 5 are given the main details of an arrangement similar to the last, but in which the ordinary lathe and slide-rest are used ; the screw of the latter forming the leading or guide screw. The first wheel of the series is here fixed to the chuck. The stud-wheel is carried by a radial slotted arm attached to the face of the poppit. Sometimes, especially for temporary purposes, instead of driving in this way, the wheel, E, is replaced by a pulley, and a cord from the overhead is brought down to it. It is rather difficult to get a sufficiently slow speed in this way, but it is a very simple one, and fairly serviceable.

Fig. 6 is Dumbleton's apparatus. C is a frame of

brass $\frac{3}{4}$ inch wide on the face, and about $\frac{1}{4}$ inch thick. The length is 5 inches. A is the pattern screw of any desired pitch, about twenty being a common rate. This is tapped into a boss, P, at one end of the frame. D has a tenon fitting inside the frame, along which it can slide by means of the screw, K, attached to it and the milled nut, H. By these means the revolving cutter, B, driven by the overhead, will trace a screw at the pitch of the guide screw. The latter is shown operating upon the outside of a box, G, seen partly in section. The serrated end, F, of the guide screw is kept in its recess on the bottom of the box, the other end being supported by the back poppit centre at R. If the mandrel is slowly rotated by hand, it will evidently give rotation to the guide screw, and thus the boss, F, tapped as a nut will slowly traverse and carry the entire frame with it. This motion gives the rate of traverse to the tool, and as this is a *revolving* cutter, the thread is sure to be cut cleanly, however slowly the work is made to rotate. In an improved form of this ingenious contrivance variously tapped bosses can be screwed into the frame, each with its own guide screw, so that different pitches may be cut. But for ordinary work in ivory and hard wood one pitch of twenty or twenty-four will serve for most cases, and the simpler the apparatus the better. I have given more details of this tool because of its reliability. It is almost a hand tool, inasmuch as it requires no framework to attach it to the lathe. It may lie on the rest as it traverses, or it may hang perpendicularly, because the axis of the screw is coincident with that of the work which, as I have pointed out, is the secret of apparatus requiring no gearing. It is, indeed, the converse of the traversing mandrel, the nut traversing instead of its screw, and the movement being transferred to the tool, which in the former case is communicated to the work. There is always an advantage in this if it can be managed without having recourse to gearing.

FISHING TACKLE:

ITS MATERIALS AND MANUFACTURE.

By J. HARRINGTON KEENE.

XI.—SALMON FLIES: THEIR VARIETIES AND THE MODES OF MAKING THEM.

THE manufacturer of a salmon fly, as I have before hinted, has a vastly different task before him to that of making a trout fly. It is hard to say which is the most difficult, for in the case of the latter not only in many cases are the flies combinations requiring great ingenuity to form at all, but there is the additional necessity for a constant observance of the natural prototype. The salmon fly, on the other hand, resembles no living thing, either bird, beast, or fish, unless it be, in sooth, similar to the gorgeous humming birds of some far tropical forest. Even in that case the likeness must be accidental, for assuredly no lordly salmon sought for in British waters, even in its remotest travels, beheld the tiny gay plumed bird, for the simple reason that the fish is unknown in such southern latitudes. Nevertheless, it must not be supposed that there is no uniformity of pattern. Such flies as the "Shannon," "Silver Doctor," "Jock Scott," *et hoc genus*, are institutions, and each of the hundreds of these patterns that are dressed every year is true to its fellow; and, what is stranger, the fish will oftentimes take only such and such particular kinds of fly, though they take no natural fly, and rarely, indeed, feed at all in fresh water. The true difficulty in salmon fly dressing, therefore, consists in the selection and combination of colours, and if you dye your own feathers in the experimental knowledge of the processes this involves, with a ready appreciation of results. I saw some dyed feathers at the stand of Messrs. Little, of *Fetter Lane*, in the Great Fisheries Exhibition, which were almost transparent when looked at between yourself and the light, showing beautiful tints of azure, vermilion, purple, and orange perfectly indescribable in words.

To plunge *in medias res* of the subject of salmon fly tying, I cannot sufficiently praise the hooks of Mr. C. Court, of *Redditch*, samples of which I have just received with bayonet points. Of course, there are other hooks in the market of equally good temper, etc., but the idea of the three-angle point is good, and in the practical test which striking a salmon gives will come out first-class—of that I have no doubt. Whether the tyro uses them or not, his first consideration is the selection of a hook proportioned properly to the size of the intended fly. Of course, he must buy his pattern, and this first consideration will therefore be of no difficulty to speak of. As to other materials, it is obvious that feathers and fur often of the most expensive kind must now be sought for, both on account of texture and colour; though the clever dyer will save much to himself by the exercise of his knowledge. Supposing, however, that these preliminaries are got over, here are the simplest directions that can be given for the making of this poem of colour.

Having selected the hook, place it firmly in your fly vice, with the end of the shank pointing to the right of you. Now take a stout round piece of gut and form it into a loop, crushing the two ends for a quarter of an inch between your teeth, that the whipping silk may take more hold on it. Now, leaving a space

of an eighth of an inch at the end of the shank (for the head of the fly ultimately), proceed to whip the gut on the hook, waxing your silk duly with the white wax already spoken of. As the bend of the hook is neared, select a nice elastic feather for the tail and tie it on, securing it, as shown at Fig. 115, page 517, with two half-hitches. Snip off the end neatly. Occasionally the tail is of several colours, according to the kind of fly, and this adds to the attractiveness of the fly. Let them be selected, and so placed as to bend upwards, as shown. Next secure your tag or tinsel and your herl, which will be that of an ostrich. Fig. 116 shows this. Take your herl now, and wind it two or three times round, as shown in Fig. 117, fasten with a turn of the silk and two half-hitches. Now take a length of floss silk, if that is to form the body, and a hackle, and tie them on with a couple of turns of the silk just above the herl. Fig. 117 exhibits the result

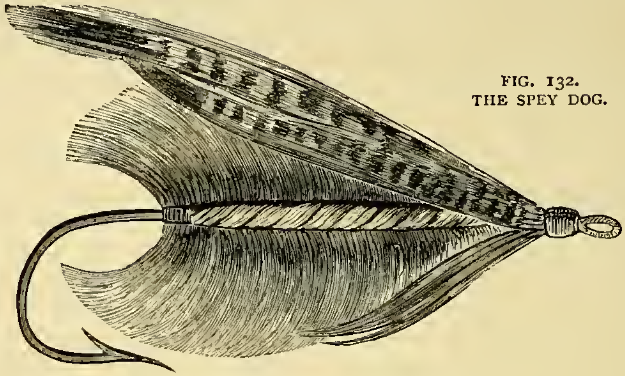


FIG. 132.
THE SPEY DOG.

requires *finesse* and neatness. A short space at the end of the shank, as we have seen, is left for the head and wings. Well wax your silk, and select your feathers so that they be of the silkiest. In a great many flies they are of various colours. Adjust them as in Fig. 120, and lap them on with two or three turns, and fasten, being careful that the fastening is secure. Take a strip of peacock or ostrich herl now, and lap it on just above the wings (see Fig. 121) to form the head. Turn it round twice, as in Fig. 122, finish off with two laps and a cloven hitch, varnish with spirit varnish, and your salmon fly is finished. It will probably be a rough one, but you will have made one on the proper lines, and, with study, will never be at a loss to manufacture the most intricate.

The "Shannon" salmon fly is the largest fly made, and also one of the most killing on the river from which it derives its name, being chiefly used when the

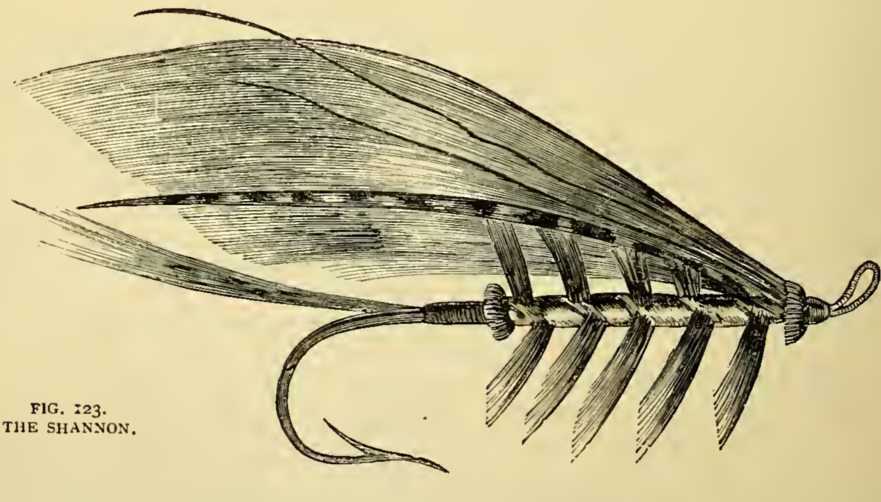
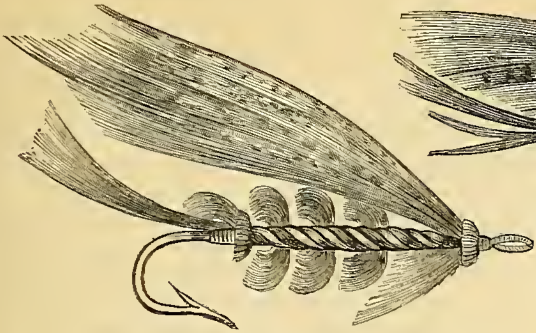


FIG. 123.
THE SHANNON.

of this. Now lightly run your whipping silk up to the top of the shank, take the floss silk and twist that also up spirally, fasten with a hitch; take the tinsel and similarly enclose the silk and fasten with a hitch; and Fig. 118 shows the appearance of the fly now. The hackle must be treated in the same way, and fastened. Fig. 119 indicates this; and now comes the process of winging, which, as in trout fly making,

water is at flood. Fig. 123 shows it at its proper size. The dressing is as follows: Body, half light orange, half blue silk, to be ribbed with silk, tinsel, and gold twist, a lightish blue hackle is strapped over one side over body, blue jay under shoulder; head, seals' fur dyed yellow, tag orange silk above it, another tag of deeper orange hue; tail, large yellow topping; wings, ten or twelve large-sized yellow toppings, sprigs of



G. 128.—SALMON FLY FOR ESK, CONWAY, AND WELSH RIVERS.

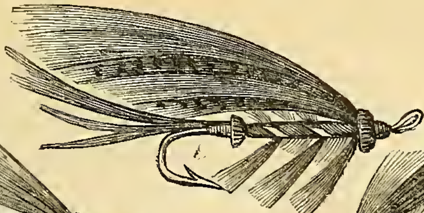


FIG. 130. THE BLUE JAY.

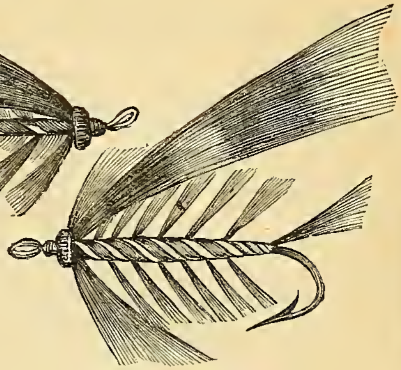


FIG. 131.—THE TOPPY.

FIG. 127.—SALMON FLY FOR DEEP AND CLEAR STREAMS.

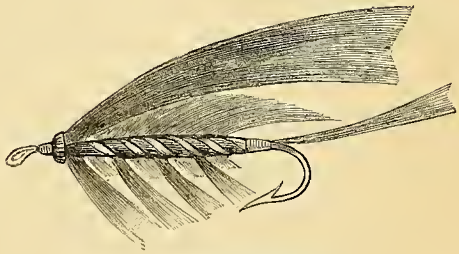


FIG. 126.—THE GOLDFINCH.

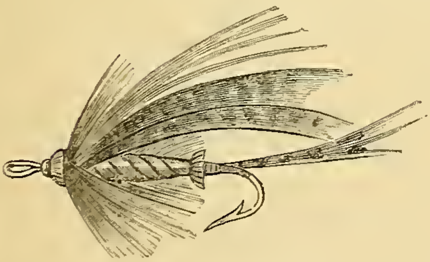


FIG. 129.—THE DUNKELD.

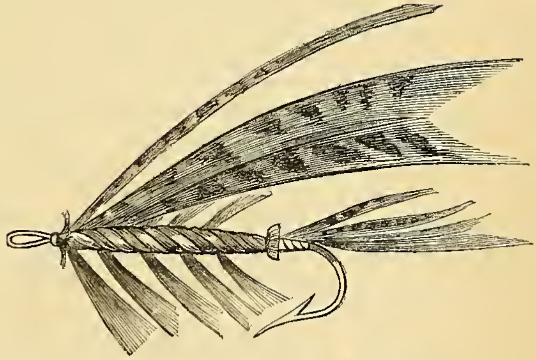


FIG. 124.—THE PARSON.

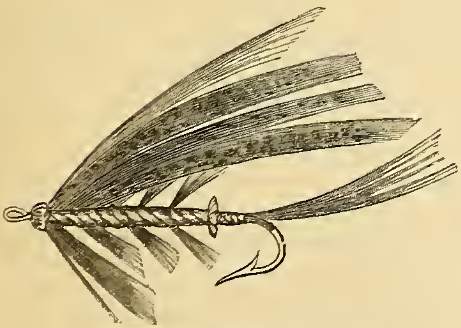


FIG. 125.—THE ONDINE.

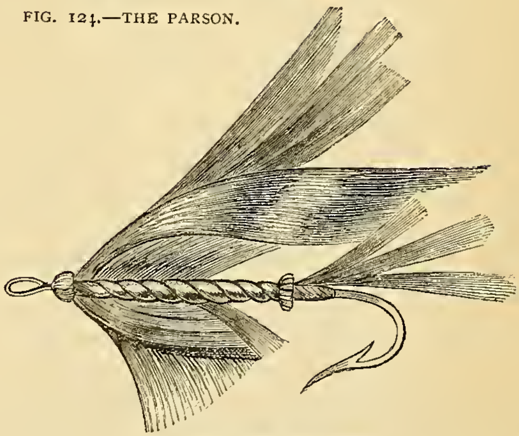


FIG. 133.—THE ORANMORE.

the leading tail feathers of the golden pheasant, and four long feelers of the blue and yellow macaw. This fly may be dressed smaller if desired, and will then kill whether the river is at flood or not. The wings may be varied by the addition of large white hackle feathers dyed red, yellow, and blue (Fig. 123). The "Goldfinch" (Fig. 126): Body, gold coloured floss silk, tag black silk tipped with gold tinsel, ginger hackle and gold tinsel over body; blue jay at shoulder; kingfisher over butts of wings, which consist of eight golden pheasants' toppings of middling size; legs, red macaw; head, black ostrich, golden pheasant topping. The "Ondine" (Fig. 125): Body, blue peacock, close ribbed with fine gold twist, two joints of green trojan feather and one of short red orange hackle under the shoulder, blue jay over the butt of the wings, small light blue tag; gold tip and brilliant little topping for tail; wings a careful mixture of fibres of bustard, silver pheasant, yellow and blue macaw, teal, guinea hen, and golden pheasant tail and neck feathers, surmounted by a topping; feelers, blue and yellow macaw; and bright blue silk head. Fig. 127 is a capital fly, and will kill on deep and clear streams. It is thus made: Body, blue floss silk ribbed with silver twist, tapering orange tag, orange topping for tail, guinea hen hackle wound close to silver twist, thickening and lengthening up to shoulder as shown; wings, a mixture of golden pheasant tail and neck feathers, guinea hen and teal feathers; blue and yellow macaw for feelers or legs; and orange peacock herl for head. The "Parson" (Fig. 124) is a very useful fly, and is thus dressed by Mr. Francis: Tag, silver tinsel and mauve floss; tail, two toppings, a few sprigs of lippel and kingfisher; body, two turns of golden floss silk, then golden wool merging into orange, twist silver orange hackle over wool, red orange hackle over that, and two or three more short toppings tied in at the breast instead of shoulder hackle, using a lippel feather with a cock of the rock on either side and one above, strips of pintail of wood-duck on either side, as many toppings as you can pile on, seven or eight more, if you like.

Fig. 128 shows a neat, attractive fly on the Wye, Esk, Conway, and some of the salmon rivers of Wales. Body, dull mohair ribbed with gold tinsel and a long fibred hackle of the same colour wound over it; tag, a sable brown herl; tail, small toppings and sprigs of bustard and guinea hen feathers; wings, divided and unseparated slips from the bustard or peacock wing, or from a cinnamon brown and dark mottled turkey tail feather; feelers, blue and yellow macaw; head, bronze peacock herl. The "Dunkeld" (Fig. 129) is thus made: Body of gold tinsel, rolled close and ribbed with silver twist and yellow hackle; the tag is of black ostrich tipped with gold tinsel; tail of small topping and small jungle cock's feather; a little blue jay at shoulder; wings, two small toppings mixed with brown mallard and peacock's wing feather; blue, yellow, and red macaw feelers; and black ostrich herl for head. The "Blue Jay" (Fig. 130) is dressed as follows: Body, light blue silk ribbed with gold tinsel, orange tag, and black ostrich; tail, small topping mallard, silver pheasant tail, mottled turkey, and guinea fowl feathers; feelers, blue and yellow and red macaw; small black ostrich head. The "Toppy" (Fig. 131), "Ephemera" gives the following dressing: The wings are to be put on so that they project like blades of scissors slightly opened; body, black pig's wool or bullock's hair, slightly ribbed with golden or silver tinsel; tag, crimson silk or mohair; next to it, two turns of red hackle, black hackle up the body; tail, yellow mohair picked out; wings, black feather from turkey's tail, tipped with white; head, crimson mohair.

I am indebted to Mr. Francis' "Book on Angling" for the representation of the "Spey Dog" (Fig. 132), as well as for the dressing which he gives, as follows: Body, black pig's wool, up this is then wound some broad silver tinsel in widish rings, over the tinsel is laid on a large black feather (it cannot be called a hackle) with a lightish dun tip, taken from the side of a Scotch cock's tail. The feather is dressed the wrong way, so that the hackle stands out abruptly, and it is carried round the opposite way to the tinsel; over this hackle is wound some gold tinsel, not side by side with the silver, but quite independent of it. At the shoulder a teal hackle. Wing, a good wad of gold pheasant tail, with two long strips of grey mallard, with brownish points over it. The fly can be varied by using a brown hackle and turkey instead of gold pheasant tail, add also orange silk between the tinsels.

Another fly of esteemed efficiency is the "Oranmore" (Fig. 133), and I again acknowledge my indebtedness to that mighty fisher, Mr. Francis Francis, for the dressing. Tag, silver tinsel, tail a topping and a small jungle cock feather; butt, black ostrich. Body, five joints of yellow and black floss alternately, divided by silver thread, and above that one thread of a red hackle stained light olive, manes of mohair from the back of each joint—the first darkish claret, second dark red, third darker claret, fourth darker red, fifth a mixture of yellow brown and red; just under, as a support to each mane, is tied a feather from the breast of an Indian crow, increasing in length (as do the manes) as they proceed up towards the wing, hackle on shoulder, olive red rump feather of gold pheasant tied in on the shoulder as a hackle, over that again a turn or two of blue jay; wing tippet fibres gold pheasant's tail and brown mallard, one topping; blue macaw ribs; black head.

I have thus in many numbers of this magazine been privileged to explain the chief processes of fishing tackle making, whereby the mechanician of the most ordinary calibre will be enabled to fabricate his tackle with sufficient skill as to, at least, satisfy his quarry when he goes "a fishing"—presuming, of course, that he intends not only to make tackle but to use it. And I would most earnestly advise all who read and have read these papers to take up the sport, if only for the greater enhancement of their execution in tackle manufacture. Such professional makers as Little, Farlow, Alfred Baily, of Nottingham, Martin, of Newark (the "Trent Otter"), are famous as well with the rod as at the fly tying or rod-making bench; and it stands to reason that this should be the case. Who can properly decide on the balance of a rod but he who can throw a fly or a spinning bait? I trust that no one has therefore disdained this series, because it has suggested the green fields and flowing streams of this our beautiful country as well as the workshop; for what the eloquent Dame Berners said nearly four hundred years since stands good now in reference to the angler: "The angler atte the leest hath hys holsome walk and mery at his ease, a swete ayre of the swete savoure of the mede floures, that makyth him hungry, he hereth the melodyous armony of fowles, he seeth the yonge swannes, heerons, duckes, cootes, and many other fowles wyth there brodes, wyche me seemyth better than all the noyse of houndys, blastes of hornys, and the scrye of foulis that hunters, fawkeners, and fowlers can make. And if the angler take fysshe, surely thenne is no man merier than he is in his spyryte."

FRET-SAWING MACHINE ADAPTED FOR SMALL LATHE.

By OLLA PODRIDA.

(*For Illustrations, see Folding Sheet issued with this Part.*)

THIS article is designed to meet enquiries respecting fret-saw adaptations for small lathes, or old sewing-machine stands. In the latter case it is intended to be adapted in conjunction with the appliances illustrated in Folding Sheet with Part 22, and described in page 526, Vol. II. of AMATEUR WORK. Although it may be mounted independently on a machine stand, yet I would prefer it in combination with the other appliances described, or adapted to a lathe, as when not required, it could be unshipped and stowed away at a small sacrifice of space.

I am well aware of the numerous fret-sawing devices in the market, and of their merits, some good, the majority indifferent, suffering more or less from the fact of their being got up to sell. There are many persons who, no doubt, feel disinclined to expend money on a machine with the chance of its becoming a source of continual trouble and vexation. Even when an opportunity occurs of purchasing a good machine the price becomes to many no *desideratum*. On the other hand, when instructions are given for the home manufacture of appliances, it is essential that the details should be designed of *makeable* forms and constructed of *get-at-able* materials, with a due consideration of cost in all cases. This I have endeavoured to carry out in the following instructions, and trust that by their aid the average amateur may be enabled to construct a cheap and serviceable appliance of the description. Should anyone taking the matter in hand find difficulty in any detail, I shall be happy to remodel the same in harmony with his resources.

References to Figs. 1, 2, and 3 will convey a clear idea of the general arrangement. At first sight the construction may appear complicated, but it is not really so, and a closer scrutiny will prove this. The figures are drawn half size. Fig. 1 is a side elevation, looking from right to left; Fig. 2 is an end elevation, looking at the front of the machine; and Fig. 3 is a plan, looking down upon it. As will be shown, wood plays the principal part in the construction. Before proceeding with the detailed work, it will be better to enumerate the parts, with a few explanatory remarks, using the letters of reference which mean the same in each figure.

The machine consists of a foundation or platform F, bolted to the lathe bed; two sheet iron brackets, B, B, screwed to F, carrying the arms A, A, on bearings at *k*, *k*; the clamps, or grips G, are swung on pins carried by small brackets *g*, secured to front end of arms; the motion is imparted to the lower arm by means of a slotted connection M, worked by a crank pin C, fixed in a disc D, carried by a spindle and bearing J, on the outer end of which is fixed a pulley P^1, which receives its motion by means of a band from the pulley P' screwed on the nose of the lathe mandrel.

The tension on the saw is regulated by means of the "Spanish windlass" at W, which is simply a modification of the twisted cord used in joiner's frame saws; a wooden spring S, serves to keep W in place should the saw break and upper arm fly "wild," and saves re-adjustment of the tension, which would, as a matter of course, be necessary should the cord be allowed to untwist.

The table T, is carried at front and back by two cross-pieces, which are mortised on to the four uprights S. The uprights at back also form a guide to lower arm as well as attachment for the blowers *b*, *b*,

which are also screwed to the arm between S, S. A piece of indiarubber tubing, partly shown at *p*, is led along the upper part of the lower arm, from thence up clear of gap to lower side of upper arm, brought forward and pointed downwards alongside of upper clamp, being secured at intervals by twine. This is not shown as it would interfere with a clear idea of the saw-frame, but it will be readily comprehended. The table is arranged to tilt, for inlaid work, by means of hinges at *h*, *h*, and secured by two small bolts shown at *t*, *t*. When raised it must be supported by wedges or packing to the desired angle.

The arrangement is shown as adapted for a $2\frac{1}{2}$ inch lathe, part of which is ticked in to aid interpretation, but the same may be employed on a 5 inch without modification. For combination with Supplement to Part 22, Vol. II., the same arrangement will also answer with a driving pulley fixed on nose of saw spindle. It may also be used on the family sewing-machine stand—due permission being obtained from the "missis"—by removing the sewing-machine and substituting the *sawing* one (all rights reserved), fastening down the platform on table top, so that the driving band may be led up through fair with pulley P^1 on crank-disc spindle.

Assuming that a fair knowledge of the general features has been obtained, we will now proceed with the details, taking each member separately, and entering fully into the details of its construction.

Foundation or Platform.—Fig. 4 represents this part, giving a plan and edge view. To make it we shall require a piece of hard wood—oak, beech, mahogany, or teak—2 feet $\frac{3}{4}$ inch long, by 6 inches wide, and 1 inch thick when finished. Plane up true, and square all edges. Mark centre lines for guidance in setting out mortise holes at *a*, *a*, *b*, *b*, for the front and back supports of table. Figured dimensions are inserted for guidance. The centre line of crank spindle, marked $6\frac{3}{4}$ inches from the end, governs the position of the aperture at *c*. This aperture is required to clear connection M, as well as allow free escape for the sawdust; it is 4 inches long by 2 inches wide, the corners need not be squared, as in cutting the hole a centre-bit will be run through at each angle, and the sides formed with a keyhole or pad-saw. A tongue fitting between the sides of lathe bed is shown at *d*. The bolt belonging to T-rest may be used to fix the platform, a suitable hole being provided at *e*. The position of the feet of sheet iron brackets B, B, is shown by the ticked rectangles *f*, *f*.

Table and Supports.—No detailed sketch is given of the table as its form is obvious. In the plan—Fig. 3—it is shown as a simple rectangle 12 inches long from front to back, and 11 inches in width, the thickness will, on reference to the elevations, be found to be $\frac{1}{2}$ inch. These dimensions are arbitrary, and may be modified to the size most convenient to the operator, observing that it should not project very far in front, otherwise it will impede the free access to treadle of lathe or machine. A small round hole about $\frac{3}{16}$ inch or $\frac{1}{4}$ inch in diameter to clear the saw through the table is required. It will be best to mark and drill this hole last thing, after the arms are in place and the clamps fixed. A portion of the table round underside of hole will require to be cut away to clear the lower clamp, as shown ticked in Fig. 1. The holes for the securing bolts are shown at *t*, *t*. The heads of these bolts will require to be let in flush with the top of table, so that a clear surface may be presented for working upon. To do this first run down a centre-bit of suitable size for head to required depth, then run a smaller bit for body of bolt right through. The hinges are let into the under side at *h*, *h*, and do not require explanation. These, as well as the bolts, may be dispensed with if it is not desired to cut inlaid work.

The supports are shown in Fig. 5 for the front ones; Fig. 6, back ones; and Fig. 7, cross-pieces for receiving hinges and securing the table to. The same scantlings are observed in Figs. 5 and 6, so that the stuff may be got out in one or two lengths, as convenient, and afterwards cut to requirements. Each piece is $8\frac{1}{8}$ inches long, $1\frac{1}{2}$ inch wide, and $\frac{3}{4}$ inch thick, so that one piece 33 inches long, $1\frac{5}{8}$ inch wide, and $\frac{7}{8}$ inch thick, will "fetch" the lot of uprights. The tenons are $1\frac{1}{4}$ inch by $\frac{1}{2}$ inch thick, $\frac{5}{8}$ inch long, to mate the cross-pieces on top, and 1 inch long, to suit the platform. In the back supports, Fig. 6, a small notch $\frac{3}{16}$ inch wide by $\frac{1}{8}$ inch deep, is shown at *a*, and it will be observed that one end of the tenon at *b*, is cut or shouldered down $\frac{3}{16}$ inch lower than the other sides, this in conjunction with the cross-piece, when the latter is in place, forms another notch or recess. These notches are for attaching the blowers, and will be fully understood when we come to that head. The back supports, seeing that they form a guide for lower arm of saw frame, must be carefully fitted square with the platform, and with a parallel working distance of $1\frac{1}{2}$ inches between the inside faces.

The cross-pieces are shown in Fig. 7, and are each $9\frac{3}{4}$ inches long, $1\frac{1}{2}$ inch wide, and $\frac{5}{8}$ inch thick. One piece of stuff 20 inches long, $1\frac{5}{8}$ inch wide, and $\frac{3}{4}$ inch thick, will suffice for these, which, as also table and uprights, are of hard wood. They are mortised to fit uprights, as shown, and reduced at *h*, *h*, for hinges. Holes for the securing bolts *t*, *t*, must be provided at *d*. These had better be marked from the table after it is hinged. The back cross-piece contains the inlet to upper blower, and is fitted with a small flap valve, shown in section, through *a*, *b*, in Fig. 16. This will be fully explained under head of blowers.

Brackets for Arms.—Fig. 8 gives profile and edge view of these, which are made of sheet iron of about 14 Birmingham Wire Gauge, or about $\frac{3}{32}$ inch in thickness; $\frac{1}{16}$ inch plate, although rather thin, will do, if thicker is not handy. Each bracket will require a piece of sheet $16\frac{1}{2}$ inches long by 11 inches wide, costing threepence or fourpence, or about sixpence for the pair. The profile is that of the form when developed, or straightened out. The ticked line at the bottom shows where the angle, caused by bending the foot, will occur. In marking out, start from a base line drawn through the centres of holes for bolts carrying the arms. This base line must be drawn *with* the grain of the iron, or clearer, the piece must be cut lengthwise from the original sheet at the shop. If cut crosswise, the foot will break off in bending. All dimensions are given, so that directions for marking out are unnecessary. One side only need be marked, the outline being centre-punched in all round for guidance. This one is then placed on the other, and two holes drilled through both, anywhere *outside* of the marks, and a good distance apart; these holes are to receive rivets for holding the two plates together during the operation of drilling the holes for bearing and stay bolts, which require to be accurately related to each other. The holes for wood screws in feet should be drilled and countersunk at the same time. Now put a rivet in each bearing and stay bolt hole, also in two of the wood screw holes, one at each corner. If this is neglected, the sides will fall apart when the first-named rivets are cut out with the superfluous material. Brass or copper wire is most suitable for these temporary rivets, as it can be easily dealt with in removal.

In cutting out to the outlines, a sharp flat cold chisel about $\frac{3}{8}$ inch or $\frac{1}{2}$ inch wide will be handiest, but the safest way is to drill small holes with, say, $\frac{1}{4}$ inch drill, all round the marks, keeping the edge of hole just clear of the outlines, and leaving from $\frac{1}{8}$ inch to $\frac{1}{4}$ of an inch between each hole and the *next.* After drilling all round, sever the intervening parts with a sharp chisel. A thick-edged chisel is inadmissible, as it would cause such thin plate to warp and buckle out of shape. After cutting out with the chisel, and before removing the rivets, file up nicely to a fair outline. In removing the rivets, take care not to damage the holes, especially those for bearings to arms. Now form the feet by bending through the ticked line shown. Care must be taken to bend each foot square with the side, and both of equal length, otherwise one bracket will stand higher than the other. It is improbable that they will be exactly equal in height, at the best, but any slight difference may be made up by packing under the short side, or "letting down" the long side into the platform. Another plan would be to bend the feet first, rivet the sides together, mark, drill, and cut out, as described above, keeping the feet fair with each other throughout. Either way may be adopted, but I think that of the two, the first one would be the easier for an amateur. A vice is essential in bending these feet; and if the iron is heated, a much better job will be the result, with greater facility in the process. Before fixing to the platform, the bearing and stay bolts must be fitted and screwed up tightly on the distance pieces. These bolts are $\frac{1}{4}$ inch in diameter, and about two inches long from the inside of head to point. They may be obtained at an ironmonger's for a few pence. The distance pieces consist of short pieces of brass tube, and are used in conjunction with the bolts, to obtain rigidity in the brackets when bolted together, as well as freedom for play of the arms. The two, which form bearings for the arms, are made of $\frac{1}{2}$ inch tube (external diameter), and $1\frac{5}{8}$ inch long. The arms being $1\frac{1}{2}$ inches square at this part, there is thus left $\frac{1}{16}$ inch clearance on each side for the reception of a brass washer, $1\frac{1}{4}$ inch in diameter, which prevents the arms from rubbing on the inside of the brackets. For the stay bolt, *k'*, Figs. 1, 2, and 3, a larger piece of tube may be used, or a piece of hard wood turned $1\frac{1}{2}$ inches in diameter, and squared nicely at the ends, with a suitable hole drilled through the centre for the bolt. If the wood is arranged so that the pressure comes on the end grain, it will answer quite as well as a brass distance piece.

If the road is not clear for the adoption of sheet iron brackets, an alternative may be employed in the form of the two wooden uprights mortised into the platform. The section of these may be $2\frac{1}{2}$ inches wide by $\frac{3}{4}$ of an inch thick, and a distance piece to stiffen them further, may be fixed between the centres of the arms. This, if adopted, will considerably reduce the scope of the saw. As designed, there is a sweep of 24 inches, with wooden uprights there would be only about 16 inches.

Clamps.—Fig. 9 shows the body of clamp; Fig. 10, the movable or adjustable part; and Fig. 11, the thumbscrew—all full size. These are all made of cast steel. A piece 6 inches long and $\frac{1}{2}$ inch square will make the lot, and leave a bit in the tongs. The forgings should be made $\frac{1}{16}$ inch larger than the finished size, so as to allow for cleaning up to proper shape. A smith would make them for about a shilling or so, or eighteenpence, and find "his own" steel. Caution him against "burning" the material, as it would then be rendered useless. See that the different parts are softened nicely to ensure easy manipulation with file, drill, taps, and screw-plate or dies.

In fitting them up, begin with the body part, Fig. 9. File up the plain side first. Get it nice and

level, then true up the inside of jaw parallel with the outside, testing it with the callipers. The V piece is filed up to angle of 90°. File up one side of the movable part, Fig, 10, and fit the V's together. Mark and drill in movable part, a hole to clear $\frac{3}{16}$ inch screw; put the two parts together and mark the centre of this hole on the body; in the centre thus found drill a $\frac{3}{16}$ inch, the tapping hole ($\frac{1}{8}$ inch full). Now rivet the parts together temporarily with a brass rivet, and clean up to shape. Polish with emery paper if finish is an object. Drill the hole for $\frac{3}{16}$ inch pin wherewith to hang the clamp. This hole must be quite square with the sides. Remove the brass rivet, tap the hole for clamp screw, and cut the teeth as shown in Figs. 9 and 10. This is done on a block of lead, with a heavy hand hammer and a short, stout, sharp, cold chisel, care being taken to hold the chisel inclined towards the V parts, so that a "burr," similar to the teeth of a vice or file, may be thrown up, which by "biting" the saw, will effectually prevent all possibility of slip occurring when properly tightened. The clamps must be tempered to a dark straw colour. First, heat them to a bright red and plunge into a can of oil. Let them cool. Brighten them up again with emery paper, so that the change of colours may be seen in the process of tempering, or "drawing down." This is done by holding them on, or near, a piece of hot iron, the poker for instance, or a pair of tongs; the colours start at a white, from that to light straw, and so on, down to dark straw, or brown yellow, at which stage they must be plunged into cold water. Only the toothed part of the clamps need be tempered, and it *must* be done in oil, otherwise, there is danger of them cracking across the hole for screw.

The clamp screws require little explanation. Their form is clearly shown in Fig. 11. They are provided with holes in the centre of the heads, which enables a small "tommy," or round lever, to be used in the event of a sudden "weakness" attacking the operator's fingers. These screws are not tempered.

Carriers for Clamps.—These are made of sheet brass, cut out first to the form shown at *a*, and afterwards bent, as shown in Fig. 12. If $\frac{1}{8}$ inch plate is found too stiff to handle, $\frac{1}{16}$, or $\frac{3}{32}$ inch, may be used. At *a*, a saw cut is shown running into each corner for a depth of $\frac{1}{8}$ inch. This will materially assist the bending of $\frac{1}{8}$ inch plates, but would not be required for $\frac{1}{16}$ inch. The clamps must fit nicely between the sides. A piece of iron filed to requisite thickness will be found handy to bend them on, with the assistance of a vice. The pin carrying clamps, shown at *a*, Fig. 10, should fit tightly in the sides of carrier, but freely in the clamp. This may be readily accomplished by slightly enlarging the hole in clamp. These carriers are fastened to each arm by two $\frac{1}{2}$ inch brass screws of No. 6 gauge.

Arms.—Fig. 20 gives views of upper arm, with a section through *a b*, showing the form of fore part of arm, which tapers from 1 inch by $\frac{1}{2}$ inch in front, to $1\frac{1}{4}$ inch by $\frac{5}{8}$ inch at the butt of back part, which is $1\frac{1}{2}$ inch square. The centres of the principal parts are given in figures. A $\frac{1}{2}$ inch hole must be nicely drilled for bearing and another for tension cord at end, with slot across the top for "windlass" arrangement at *k*. This arm should be made of ash, although oak or teak would answer well. The spring, seen at *s*, Fig. 1, should also be made of ash, and the screw which secures it should also allow of its being turned round out of the way while tightening the cord.

Fig. 21 gives form of a lower arm, which should be made of hard stiff wood, so that all the spring required in tension may be thrown upon the upper arm. On reference to the figures it will be seen to be $1\frac{1}{2}$ inch square at the back part for a length of $7\frac{3}{4}$ inches (same as upper arm). It then tapers in depth to $1\frac{1}{8}$ inch in the wake of the connection M, but maintaining a width of $1\frac{1}{2}$ inch, as seen on the plan.

At the front end it is reduced to a width of $\frac{1}{2}$ inch, and tapered in depth from $1\frac{1}{8}$ inch to $\frac{1}{2}$ inch. The centres of clamps, connection M, and blowers *b*, are shown by the ticked lines *c, d, e, f*, and *g, h*, respectively. The mortises for connection are $\frac{3}{4}$ inch long by $\frac{3}{8}$ inch wide with a *space* of $\frac{1}{2}$ inch between. At the outer end of lower, or working arm, two holes are drilled at *m*, one for each part of tension cord. These holes should be countersunk on the underside to prevent cutting of the cord.

Crank Connection.—Fig. 18 shows this part in detail. It must be made of sound, hard, close-grained wood. Beech would be suitable. The tenons must be made a good fit to mortise holes in arm. The slot must be cut out nicely to fit crank-pin. In cutting this out, drill two holes, one at each end, of crank-pin size, and $1\frac{1}{2}$ inch apart as figured; with a fine pad-saw remove the intervening material, and finish off with a file. The slot will wear better if slightly scorched with a hot iron.

Pulleys.—Fig. 15 shows pulley for nose of mandrel. It is made of hard wood screwed on the mandrel, and turned up in place to 3 inches in diameter. It is shown grooved for a $\frac{5}{16}$ cord.

Fig. 19 is the pulley for crank-disc spindle, likewise of hard wood turned to 4 inches in diameter and similarly grooved. If bored to a tight fit on spindle it will drive sufficiently by friction only. If this is not attained, a "bush" must be bored to fit the spindle, and driven tightly into the pulley, which is finally secured on the spindle by means of a small key or pin driven into a hole drilled half in the spindle and half

in the bush. This pin may be about $\frac{3}{32}$ inch in diameter.

Driving Spindle.—Fig. 14 gives this. It may be made out of a piece of $\frac{1}{2}$ inch round iron turned down to $\frac{3}{8}$ inch for the pulley and bearing, and about $\frac{1}{32}$ inch less for the disc, so that a slight shoulder may be formed for the latter to drive against. The spindle should be cut to the neat length, and the ends squared before turning, so that the centres may be left in. All works turned between the lathe centres should have, where possible, their centres left or retained for conveniently making any alteration which might occur. The end which receives the disc must be finished last.

Crank Disc.—Fig. 22 gives front elevation and section of this part. It must be made of hard tough wood, hornbeam would be best, but beech will do. It should be bushed and keyed on the spindle so that it may be turned and faced on its own axis. The crank pin must be firmly secured into the face at a distance of $\frac{5}{8}$ inch from the centre, thus giving to the saw a stroke of about $1\frac{1}{4}$ inches. A circle struck with a point tool in the lathe will form a guide in fixing this pin, which is simply a brass wood screw about $1\frac{1}{4}$ inch or $1\frac{3}{8}$ inch long, and $\frac{5}{16}$ inch or $\frac{3}{8}$ inch in diameter. It should not be less than $\frac{5}{16}$ inch, and need not be more than $\frac{3}{8}$ inch diameter.

Bearing for Spindle.—Fig. 17 gives two elevations and a plan of this. Hard wood must be employed. It may or may not be bushed with brass, as it will run very well for a considerable time without the bush, which may be fitted afterwards when the hole has become worn. Of course the best job would be to bush at first. Do not forget to put two oil holes in the top about $\frac{3}{8}$ inch from each end to ensure thorough lubrication.

Blowers.—There are two of these fixed on upper and undersides of lower arm. Two being employed, the result is that practically a continuous blast is obtained with perfect freedom from the accumulation of sawdust on the face of the work. Fig. 13 will give a clear idea of the arrangement of these blowers. This view is a section through the cross-piece supporting table, upper bellows, arm, and lower bellows. The flap valves may be made of leather, indiarubber, or even ferrotype. The inlet valve to upper bellows is glued and tacked to underside of cross-piece; the inlet passage consisting of two holes drilled to intersect at right angles to each other as shown. The valves are $\frac{3}{4}$ inch long and $\frac{1}{2}$ inch wide.

The top of upper blower consists of a piece of wood 2 inches long, by $1\frac{3}{4}$ inch wide, and $\frac{3}{16}$ of an inch thick with a rectangular hole, to clear the valve, cut it in the centre. This part must fit between the uprights into the notch, at *b*, Fig. 6, and tight up under the cross-piece, and should be fitted with a little taper, or wedge fashion, to ensure air-tightness. The flexible sides of bellows may be made of sheepskin, or patent leather. A piece $7\frac{1}{4}$ inches long by 3 inches wide will be required for each bellows. In making them, lap the ends of the leather $\frac{1}{4}$ of an inch over each other, and glue firmly together, further security is given by stitching, which must be done at once and drawn tightly *before* the glue sets. The leather part of each bellows is made separate from the valve plates, and stretched and glued on two frames, one at each end. These frames, shown in black, are $\frac{1}{8}$ of an inch thick and 2 inches long by $1\frac{3}{8}$ inch wide to clear the inside of the supports. The leather having been cut $7\frac{1}{4}$ inches long, and lapped $\frac{1}{4}$ of an inch, it will be found necessary to stretch it $\frac{1}{4}$ of an inch before it will take the frames. This is essential as it inclines, the bellows to pucker *inwards* and not bag out against the supports, the friction against which would soon produce holes. The leather should overlap and be turned in on the frames $\frac{1}{4}$ of an inch and well glued. The ends and valve plates are also glued on. The delivery valve plates, which are secured to the arms, are 3 inches long, $1\frac{1}{2}$ inch wide, and $\frac{3}{8}$ of an inch thick. They must be recessed, as shown, to receive and allow free play for the valves. The upper one has a groove cut to meet the hollow wooden plug to which the delivery pipe is attached. This is clearly shown in the drawing. The lower inlet valve is carried by a plate, $1\frac{1}{4}$ inch square, and $\frac{1}{8}$ of an inch thick, glued to bottom of bellows. This bottom is of the same dimensions as the top, and fits into the notches shown at *a*, Fig. 6.

The action of the blowers, or bellows, is quite simple. As the arm descends air is drawn into the upper blower through the inlet at the top, and expelled from the lower one through the delivery valve at the top, and hole through arm, thence through space under upper delivery valve into the pipe, the upper delivery valve being kept closed by the pressure from below. As the arm ascends a similar action takes place *per contra*.

These blowers need not be fitted unless desired, but knowing their value, I strongly advise their adoption, being easily made, and the means of saving much discomfort and parched lips. If satisfaction will be afforded by fitting one blower only, let it be the upper one, as the greater part of the saw-dust being carried *up* by the saw, it will be removed by the "puff" caused on the up stroke.

General Remarks.—Fit the brackets and table to platform first. See that they stand square with each other, so that the path of the saw may also be square with the table top. The machine should be erected complete, and every part tested before being finally

fixed. The word "finally" applies to the tenoned parts which are glued in place. When a tenon has to be glued, it should only be made "hand tight," *i.e.*, capable of being driven, or pushed into its mortise by hand until it is nearly "home," when a slight tap with the mallet should accomplish the remainder. Tenons may fit tightly against the *end* grain of the mortise, but not against the side, as in the latter case there is danger of splitting.

The inside of back supports, which form a guide to the lower arm, must be kept lubricated with a mixture of lard and blacklead to reduce the friction. The slot in crank connection must be served the same way. Soap will answer very well, but blacklead also should be used.

In changing the saw from one hole to another the upper clamp screw must be slackened. The machine should not be driven too fast; when the smell of hot sawdust becomes apparent, it is time to slack speed, or a good saw may be spoilt by losing its temper. The slowest speed of the lathe will be found plenty fast enough, at least, that is my experience.

I trust that the foregoing instructions will enable those desirous of possessing a serviceable machine, to construct it themselves in a cheap and substantial form. The materials are within everybody's reach, and the design is simple with regard to strength and the resources of amateurs in general. Should any difficulty be experienced with it, I shall, as already offered, be happy to further explain any detail, or modify it to suit the special circumstances of the maker.

BOX TURNING AND INLAYING.

By LOIDIS.

WOOD for box turning and inlaying, should be of the best quality obtainable—that is, it should be well seasoned, and without shakes or knots, as if it is not dry, the box will shrink out of shape, and the inlays will probably fall out, as they must be put in without glue; if the wood is shaken, the lid of the box will perhaps split when driving them in, and if it is knotty, of course, it is bad to turn.

The first thing is to make the chucks; the one for turning the box itself should be like Fig. 1. Take a piece of birch, or other hard wood, and cut out of it a piece as near circular as possible, $1\frac{1}{2}$ inch thick and 6 inches diameter, screw it on the face-plate of the lathe, and turn it till it is perfectly round, and then make the face slightly hollow, and turn a recess in the middle $2\frac{1}{2}$ inches diameter and $\frac{5}{8}$ inch deep, and then it will be complete.

Next, for the "eccentric" chuck, get a piece of hard wood 10 inches diameter and $1\frac{1}{2}$ inch thick; turn it circular and make the face quite flat, then bore a number of $\frac{3}{8}$ inch holes in, as in Fig. 2; next make or get made of $\frac{3}{8}$ inch round iron, two dogs, as Fig. 3, with a nut and washer each; put them in any two holes of the chuck, and then it will be complete.

Those who are possessed of eccentric chucks will have no need to make one of these, but those who are not so fortunate will find that this simple apparatus will do all that is required in this branch of the turner's art; and also, that it has the recommendations of being easily made and very cheap.

Having made the chucks, the next performance is to make a box. It would not be wise for a beginner, unless a practised turner, to try to make a large and intricately inlaid box for the first trial, so I will begin with a small one. Take a piece of box, rose, satin, or any other nice wood, 3 inches diameter and 4 inches long, and turn it till it is round, then reduce one end to fit tightly into the hole of the box chuck, Fig. 1, drive it in and see that it runs true; then face up the end and proceed to turn the box lid in the following manner:—Turn a recess in the end of the piece of wood, $\frac{5}{8}$ inch deep and $2\frac{1}{2}$ inches diameter, leaving a rim $\frac{1}{4}$ inch thick all round (*i.e.*, supposing the piece to be 3 inches diameter), as in Fig. 4; next, cut it off to $\frac{7}{8}$ inch long. This must be done with a chisel called a parting tool, it should be about $\frac{1}{8}$ inch wide and $\frac{7}{8}$ inch deep, as in Fig. 5, and rather wider at the cutting end than the other part, so as to work freely in the groove.

When the lid is cut off, there will be $2\frac{1}{2}$ inches left for the box; on this turn a rebate about $\frac{1}{4}$ inch deep and $\frac{5}{16}$ inch wide, so that the lid will *just* fit on, not very tight and not very slack; next proceed to hollow out the box, about $1\frac{7}{8}$ inch deep and $2\frac{1}{4}$ inch diameter, thus leaving $\frac{1}{8}$ inch inside the rebate. I think the best way is to turn a spherical hollow to the required depth and then square out with a chisel or the parting tool; when this is done put on the lid and inlay it like Fig. 6. The inlays should be discs of different sorts of wood, about $\frac{1}{4}$ inch thick; if you do it like Fig. 6 you will require six, the largest will be $1\frac{1}{2}$ inch diameter, the next $1\frac{1}{4}$ inch, the next 1 inch, and so on, each decreasing by $\frac{1}{4}$ inch. To put them in turn a recess in the lid $\frac{3}{16}$ inch deep and large enough to fit tightly the largest disc, drive this in, and turn a hole in this to fit the next smaller, drive in, and do them all the same way; when they are all in level them off and turn mouldings on the box to suit your own taste. Fig. 6 is a suggestion. Then sand-paper and cut off in the same way as you cut off the lid. I should not advise any one but a skilful turner to put eccentric inlays in so small a box for the first trial.

When you have successfully accomplished this small box, you will, I expect, want to try a larger one, so take a piece of wood to turn up to 5 inches diameter and $5\frac{1}{2}$ inches long, and proceed as before to turn a box and lid, and when you have got them complete, except moulding, cutting off and inlaying, take the lid and set with compasses like Fig. 7; then turn seven inlays 1 inch diameter, seven $\frac{3}{4}$ inches diameter, seven $\frac{1}{2}$ inch diameter, and seven $\frac{1}{4}$ inch diameter, each size of a different sort of wood. Put the centre ones in as before, but for the other ones you will require the eccentric chuck. Place the lid on the chuck with No. 1 (Fig. 7), as near the centre as you can guess; put the dogs in two holes so that they will catch on the lid, screw them up lightly and then gently tap the lid with a hammer till you get No. 1 perfectly in the centre; then proceed to put in the inlays as before; when you have put

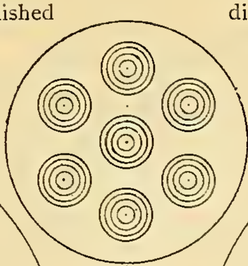


FIG. 7.

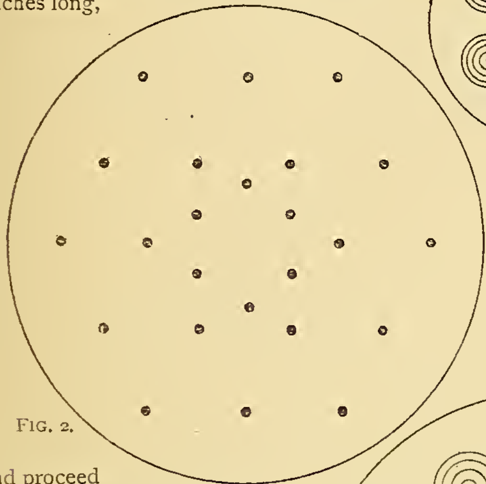


FIG. 2.

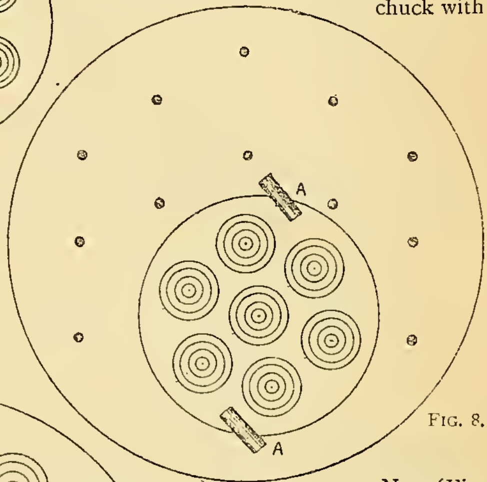


FIG. 8.

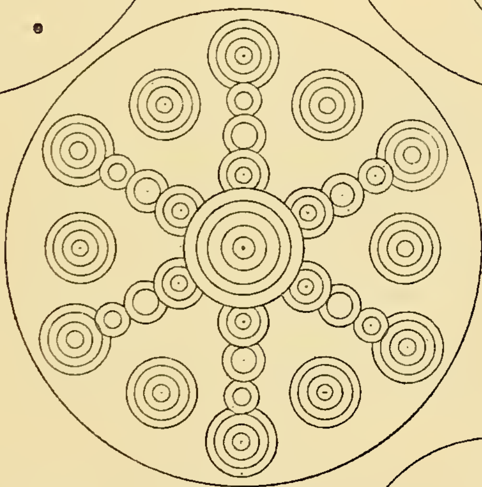


FIG. 9.

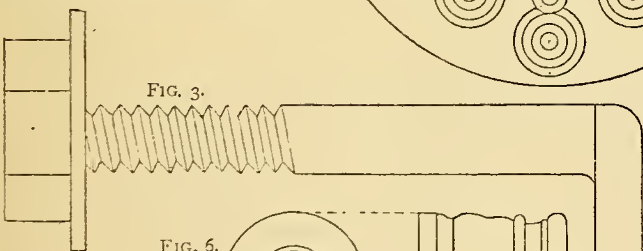


FIG. 3.

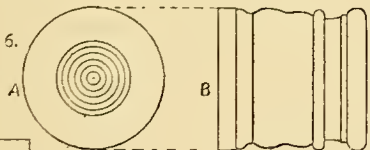


FIG. 6.

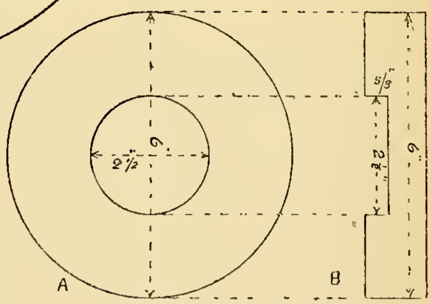


FIG. 1.

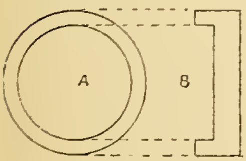


FIG. 4.

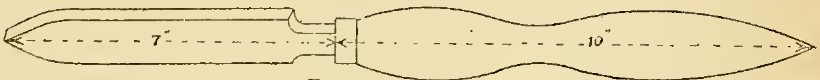


FIG. 5.

FIG. 1.—CHUCK FOR TURNING BOX.—A, PLAN; B, SECTION. FIG. 2.—HARD WOOD ECCENTRIC CHUCK. FIG. 3.—DOG, WITH NUT AND WASHER, FULL SIZE. FIG. 4.—LID OF BOX.—A, PLAN; B, SECTION. FIG. 5.—CUTTER. FIG. 6.—INLAY ON LID OF BOX (A), AND MOULDINGS ON BOX (B). FIG. 7.—ANOTHER FORM OF INLAY FOR LID. FIG. 8.—LID ON ECCENTRIC CHUCK HELD BY DOGS, A, A. FIG. 9.—THIRD DESIGN FOR INLAY OF BOX LID.

them all in, level them off and place No. 2 in the centre, and proceed as before, and so on, till you get them all done; then put the lid on the box, put the box in the lathe and finish off. Fig. 8 shows the lid fixed on the chuck. Fig. 9 is a design (half full size) for the inlaying of a box lid. All the other figures but one, are to a scale of 3 inches to the foot, or quarter full size.

It is an advantage when doing this kind of inlaying, to have as few sizes of inlays as possible. If I have not made any point clear and intelligible, I shall be pleased to answer any questions in "Amateurs in Council."

THE AIR PUMP, AND HOW TO MAKE IT.

By O. BECKERLEGGE.

WINTER evenings are often dreary, simply because we want employment of an intelligent and entertaining kind. I purpose giving instructions for the construction of an air-pump, which, of itself, is an instrument adapted to give information to the younger branches of a family, and to illustrate many subjects which are of deeper interest to adults; especially the action of electricity in vacuum. Besides which the construction is by no means difficult; care more than skill being required. For years, I have meditated constructing one, but feared to venture; having made one, I am now surprised at its simplicity.

Of course, it will be understood that to produce a perfect vacuum is almost, if not absolutely, impossible. The highest vacuum, such as is required for electric lamps, is produced by mercury, falling drop by drop, through a long glass tube of small bore. A similar arrangement is adopted for water. The pump, however, which we now purpose describing, is the common form of a piston working in a barrel. This principle is worked out in a variety of ways. There is the double-action pump, known, I believe as "Tates." Then there is the double barrel, worked by rack and cog-wheel; and, last, the simple single barrel, which though somewhat slower than the double-action, and harder than rack work, is not too hard to work, and much easier to construct. I might say, however, having mastered the principles, to work out any other form, is easy.

There are three essentials to the instrument: the barrel with its piston and valve for producing the vacuum; the plate to receive the object to be experimented on; and, last, the base on or to which the whole is secured, so as to make it a working machine.

Fig. 1 gives a sectional view which, carefully studied, will both save descriptive matter, and meet at least with the approval of the Editor.

Let us, in the first place, see what material we shall need. For the barrel, procure a piece of brass tube ("drawn" so that the inside may be smooth), 1 foot by $1\frac{1}{4}$ inch in diameter, 1 foot 6 inches of $\frac{3}{4}$ inch diameter, 2 feet of $\frac{3}{8}$ inch diameter.

Sheet brass 6 by 3 inches by $\frac{1}{8}$ inch thick. These, with board for base, will be the principal material needed, not costing more than 2s.

I shall suppose we can avail ourselves of the use of a lathe, but if not, for all practical purposes, we can do without. Take the tube for the barrel and cut it to the length desired, say 9 inches—sometimes amateurs err in making the barrel too long and too large; the size given will be hard enough to work, and large enough for all ordinary purposes. True up the ends; $\frac{1}{2}$ inch from one end bore a hole not larger than a small pin head. Cut out a piece of sheet brass 2 inches square, and face the sides up true. We will now make the valve. For this purpose, cut a piece $\frac{1}{2}$ inch by $\frac{1}{4}$ inch, another piece $\frac{1}{2}$ inch square. Solder these together, the small piece in centre of the larger. With a soldering bit solder the centre of the piece 2 inches square, and give a touch of solder to the small part of the two pieces just made. Now place the smaller piece on the centre of large piece, touch the solder with the hot bit, and see that it runs, uniting them firmly together, when completed it will be like Fig. 2.

With a drill make a hole the size of a pin head through the whole centrally. Now take the barrel, and having moistened the edge of the end with the pin hole in it, with soldering fluid, run solder around it, also run a circle of solder on the piece we have just made, but on the opposite side to that on which we have made the valve. See that there is no burr or roughness on the edges of the small holes made. Now place the tube on the square plate centrally, and with a hot bit make the solder run, so that the plate is securely fastened to the barrel. One thing must be most carefully attended to—every joint must be perfect. If a hole is left—even of microscopical dimensions—it will be surely fatal to our air-pump. For security we had better test every part separately. Take the tube, and with the fingers stop the two holes which have been drilled, and immerse the end with the joints in water, and vigorously blow. Now, if there is any leakage it will show itself by a rush of bubbles. Being satisfied, we proceed to make an elbow joint leading to the plate of the receiver. Cut off 9 inches of the $\frac{3}{4}$ inch tubing, also cut off $\frac{3}{4}$ of an inch, and with a saw or file cut a piece out of it lengthways,

sufficient to make it slip into the $\frac{3}{4}$ inch tube when the edges are joined. With a file clean the inside of one end of the long piece, insert the short piece, leaving $\frac{1}{2}$ inch projecting, and firmly solder these together. Cut the end true, and solder a disc of brass to the end with a small valve, precisely as the one made before for the barrel, Fig. 4. When this is completed cut off $1\frac{1}{2}$ inch of $\frac{3}{4}$ inch tube, make a small tube to go into tbis by cutting out a piece of a short length, say $\frac{3}{4}$ incb long. The inside of the one and the outside of the other must be cleaned, slip the short piece into the other, and moisten with soldering fluid. With a hot soldering tool cause solder to run between the two ; if done nicely they will be as one piece. We have now a thickness which will admit of turning. A thread must be cut on the projecting end, A, Fig. 4, of the long tube with the valve, and an internal thread on tbe short piece last made ; let the joint be a good one. Supposing there is no lathe, then the hest possible joint must be made with a file, and the joint must be made air-tight with white lead. You will find, most probably, that with the hest joint you can possibly make with a lathe and screw, there will be a leakage of air, the joint must tberefore be made good with white lead. The sbort length must now have the other end to that whicb is screwed filed hollow, so as to fit the side of the barrel, Fig. 1, D. When made a good fit, solder it to the barrel with the pin hole in the centre. Wben you have tacked it in its place, screw on the valve piece, and see that it stands at right angles with the barrel, wben everything is right strongly solder tbe piece, and test for leakage as before directed.

We want now to make an elbow to this connecting piece, as we shall call it in future. At the opposite end to the valve cut a mitre, seeing that the elbow is parallel with tbe barrel when the connections are in their place. Cut another piece of the same $\frac{3}{4}$ inch tubing about 2 inches long, mitre one end and insert in the other a smaller tube, projecting, say, $\frac{1}{4}$ inch. On this projection there should be cut a thread ; now solder tbe elbow, making a perfect joint, screw the connections to the barrel, and we see the essentials of an air pump. But not too fast ; we must complete the valves. Be careful that there is no burr at the edge of the pin-holes. Cut a strip of oiled silk as wide as the top of the valve, and about 1 inch long, place it across the top, pull the ends down tightly ; now with strong silk tie it on. As the base of the valve is smaller tban the top, the tbread will keep the silk in its place ; be sure all sharp edges have been taken off with a file, so that neither the silk nor its ligature is in danger of being cut. This valve will allow air to pass freely one way, but will effectually prevent it passing the other.

We will now begin with our stand ; for this purpose we shall require a board, say 15 by 8 inches by 1 inch thick. At each corner glue and screw a piece for feet, neatly fashion these to your own taste ; mahogany with the edges chamfered, and the whole nicely polished, will look very well. Now make two holes the sizes of the respective tubes, the barrel being ahout 2 inches from one end of the stand. On the under side cut a channel from one hole to the other, this will form a bed for the connecting tube. Pass the barrel up from below, see that everything is square and barrels perpendicular, and through four holes in the corners of the bottom of the barrel firmly screw it to the base. Our barrel will look better if there is a top made, and, indeed, there must be some kind of guide for the piston rod. This is the plan I adopted. Get a short bit of tube, say $\frac{3}{4}$ inch, just large enough to fit tightly on the barrel. File one end square, or turn it, prepare a piece of sheet brass large enough to cut a disc just a trifle larger than the tube, and solder on the end. Cut off $\frac{3}{4}$ inch of $\frac{3}{4}$ inch tube, square each end, and solder this on the other side of the disc. Of course, the precaution has been taken of making a centre punch mark, and drawing two or three circles as guides on the disc. In the next place, solder a small disc on the end of the small tube. Put on a lathe and turn them up, and if the edges of the top are milled it will make a very handsome finish to the tube ; of course, a hole must be drilled through the centre for the piston rod to work. With a very slight modification this top can be made into a stuffing box. There are several ways to make a piston ; we will, however, take first the simpler plan, and which can be used with the instrument as made so far. Take a length of brass rod or tube $\frac{3}{8}$ inch diameter, 12 inches long ; if a tube, then one end must be plugged, and solder up, file up two discs of brass small enough to pass into the barrel ; in each make a central hole. Solder these on the rod about 1 inch apart. There is now a kind of spool formed, on which wind worsted sufficient to make an air-tight piston. Face the end with a film of cork cemented with shellac or any other waterproof cement. At the top of the rod fix a handle fastened by a pin. Now if the piston is air-tight, on pulling up the rod and letting it go it will spring back, supposing we stop the end of the small tube. It is quite likely you will not get the requisite quantity of worsted on at first, you must however pack it until it is air-tight, not an easy matter, true, but quite possible.

When everything is so far finished to our satisfaction, with emery cloth rub up the barrel the long way, and when all scratches are removed, polish with rottenstone, and then lacquer. We now need a stand for the receiver, this may be made either of

sheet brass or glass, cut either square or round. Whatever it is, it must be as level as possible, any winding or buckles would render a receiver unable to rest on it dead. If of brass, let there be a central hole with a thread cut in it to fit the tube which has been prepared. If, however, for any reason we decide on glass, then the tube with a screw cut on it, must be made longer ; place a washer of rubber on the seat, place the plate in position, then on it lay another washer, and then fasten altogether with a brass nut ; make it air-tight with white lead. To give greater support to the plate, I cut a length of large tube as long as the distance between under side of plate and the base, and cut two discs of wood to fit into it with a central hole the size of the connection tube. I slipped this over it, and screwed the plate down to it ; this I find gives greater stability and a look of greater solidity, Fig. 1 B. I think I may say our pump is now completed, though I may just add here that I have found a little water placed on the top of the piston finds its way into the worsted, and by swelling it converts almost instantly a leaky piston into an air-tight one. Although our air-pump proper is finished, I should recommend a small tube, A, Fig. 1, to be inserted into the connecting pipe, the end either furnished with stop-cock or plug. This will be of great service, as it will enable the operator to admit air or gas into an exhausted receiver, also to it may be attached a tube, supposing we should wish at any time to experiment electrically with a vacuum.

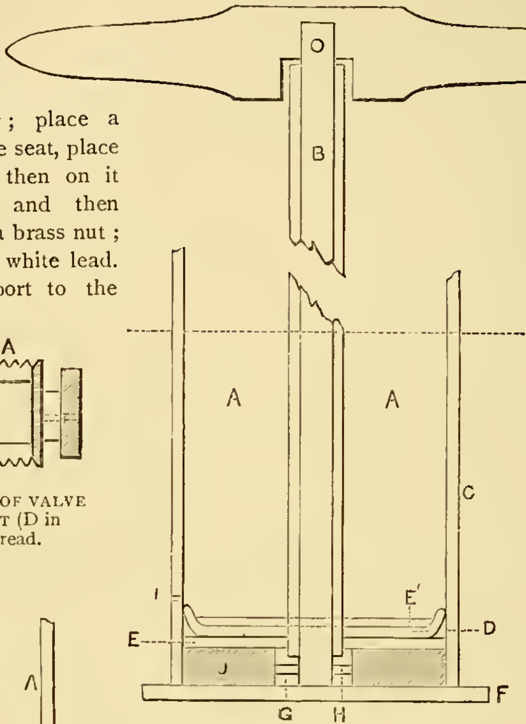


FIG. 3.—MECHANICAL VALVE IN PISTON ROD.
A, Outer Tube. B, Rod in Tube. C, Barrel. D, Indiarubber Washer, $\frac{1}{8}$ in. larger than Barrel. E, E′, Brass Discs holding Washer in place. F, Bottom of Barrel. G, Brass Disc at end of Piston Rod. H, Indiarubber Washer cemented to Disc. I, Pin-hole in Barrel. J, Cork Washer cemented to Disc E.

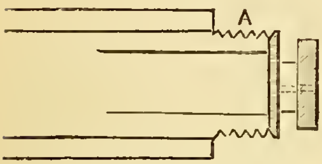


FIG. 4.—ENLARGED VIEW OF VALVE AT END OF ELBOW JOINT (D in Fig. 1). A, Screw Thread.

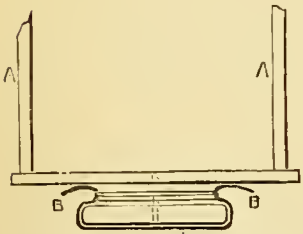


FIG. 2.—ENLARGED VIEW OF VALVE.
A, End of Barrel. B, Silk tied over Block. Dotted lines show pinhole.

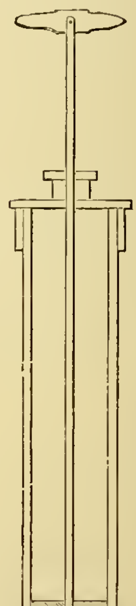
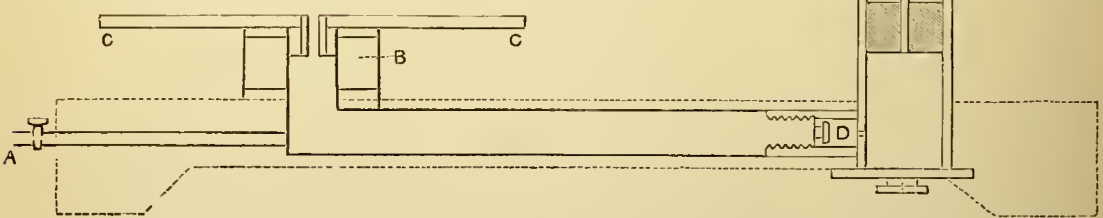



FIG. 1.
SECTION OF AIR PUMP.
A, Tube with Stop Cock inserted in Connecting Pipe. B, Disc of Wood between Connecting Tube and Receiver. C, Plate of Receiver. D, Valve at end of Elbow Joint.

I will now explain another kind of piston which is highly recommended by some experimenters. It dces away with the under valve in the barrel, as the piston acts as a mechanical valve. One reason why a high vacuum cannot be obtained in an ordinary pump is, that when a certain rarity of atmosphere is attained in the receiver or in the vessel being exhausted, the

amount of air that rushes into the barrel at the up stroke of the piston is so little, that when compressed by the down stroke it is insufficient to overcome the atmosphere which presses on the outer valve. The piston I now will describe, will, to a certain extent, overcome that difficulty, as the valve opens mechanically, and is independent of the pressure of the internal atmosphere. I think Fig. 3 will give the amateur worker a clear conception of it. I will, however, give what directions may be deemed necessary. Cut off a length of $\frac{3}{8}$ inch tube which shall be 2 inches longer than the barrel. At one end cut a screw thread out of stout sheet brass, cut or turn two discs, one of a size to pass easily into the barrel, the other, say, $\frac{1}{16}$ inch smaller. In the centre of each drill a hole, and cut thread to fit the tube we have just screwed. Put on the smaller disc, on this place a ring or washer of indiarubber $\frac{1}{8}$ inch larger than the barrel. Now screw on the larger disc, let these be screwed so as to press the washer between as tightly as possible. Let the lower disc be just level with the end of the tube, which must be perfectly true. We now take a length of stout brass wire or rod, just small enough to easily work in the tube. On the end of this screw, and then solder for additional strength a disc a trifle larger than the outside diameter of the tube. On the disc, place a washer of leather or indiarubber, and fasten it to the disc with cement. Procure a piece of sheet cork, cut a washer the size of the barrel; with a central hole large enough to allow the disc at the end of the rod to move easily, saturate this disc with shellac varnish, and cement it with shellac to the disc, E, Fig. 3. Pin the piston *rod* to the handle in the way indicated, so that it shall be $\frac{1}{8}$ inch longer than the piston *tube*. When pushed down the disc at the end of the *rod* should be level with the cork disc, at the end of the *tube*. One thing must be attended to—the piston must be so arranged that it shall sink below the pin-hole in the side of the barrel, I, Fig. 3. The action of this piston will be as follows: Suppose the piston is pressed down to the bottom, the air in the barrel, and in the receiver are equal. On lifting the handle the *rod* moves before the tube, it being $\frac{1}{8}$ of an inch longer; as the pull is made, the rubber disc makes an air-tight joint with the bottom of piston tube, the stroke exhausts the barrel which is supplied through the valve I, Fig. 3. The weight of air in the barrel performs the service of pressing the rubber disc, D, more firmly against the barrel. As soon as the down stroke commences, the *rod* again moves first, the air now will rush into the barrel, and with the pressure of the descending piston effectually close the valve in connection with I. On reaching the bottom, the air has been forced up the tube when the action of the handle again closes the valve by raising the rod before the piston moves. By this piston a high vacuum can be reached as the residual air at the end of the stroke is exceedingly small, and the opening of the valve is not dependent on the weight of the air. I think anyone following these directions faithfully, will have an instrument of considerable efficiency, and at a cost of material of not more than some 3s. or 4s.

HOW TO CONSTRUCT A SIX-INCH WOODEN LATHE.

By OLLA PODRIDA.

IV.—DETAILS OF FLYWHEEL AND TREADLE.

CONSTRUCTION OF FLYWHEEL.—In proceeding with this the arms should first occupy our attention. The arms complete are made by halving and bolting together two pieces of wood of the form given in Fig. 34, which shows one of the members in front and edge elevation. To make each member, a piece of wood 26 inches long by $4\frac{1}{8}$ inches wide and $2\frac{1}{8}$ inches thick in the rough, will be required. Ash, if procurable, should be employed; failing ash, pine, sound and free from knots, may be employed. First plane up to maximum section—4 inches by 2 inches—then gauge centre lines on the sides and edges of each member for guidance in halving them together, and also in setting out the extremities to form given. The arms may now be halved together. This must be done carefully, so that the centre lines may be brought to correspond exactly. It is important that each member shall lie fair with the other. The centre of the eye must be marked upon both sides of each member, and before halving them together, or boring the eye, the shoulders at A A, Fig. 34, should be struck out, or marked with a compass or trammel. These shoulders must be cut carefully, and the marks adhered to, otherwise the rim will be thrown out of truth. The eye should be bored from both sides, or from the *outside* of each member if it is more convenient to bore them separately. The size or diameter of crankshaft will determine the size of bit required. The shaft should fit tightly; as shown it is $1\frac{1}{2}$ inch in diameter. The plates, one for each side, as shown in black section at A, A, Fig. 40, and also in detail in Fig. 35, may now be fitted and the arms bolted together by four quarter inch bolts. The holes for these bolts may be $\frac{1}{16}$ inch larger than the body of the bolt, thus allowing a little freedom, so that the wheel may be set a little if found out of truth when finished. The arms being completed we may proceed with the construction of the rim.

Rim.—This is built up in three layers of inch stuff, each layer consisting of four segments. The timber used should be of as heavy a nature as possible. Oak would be about the best in this respect. Pitchpine would also be suitable; but in any case the builder will be governed by circumstances. To make the various members forming the rim, we shall require a board 14 feet long by 1 foot wide, and $1\frac{1}{8}$ inch thick in the rough. Four lengths, each $3\frac{1}{2}$ feet long will be much handier to work, as the stuff must be planed up to a gauge thickness of one inch.

To mark out the segments, a template, or mould, made of thin wood, cardboard, or stout paper, cut to the requisite curve and length, will be found convenient. Fig. 36 shows this template. Figured dimensions give the radii of the different steps or speeds, which should all be struck at the same time from the common centre, then after the template has been used, for the largest it may be altered to the next, and so on. The figured dimensions for the outside diameters, allow half inch on each diameter for turning and finishing, but the inner radius, which is common to the three layers, is given in finished dimensions, and must be carefully worked to so that the segments may correspond when put together. In cutting out the largest and smallest segments, a small allowance—say $\frac{1}{16}$ inch—may be left on the ends for butting together in building; the middle layer having to be fitted between the arms, will not require any such allowance.

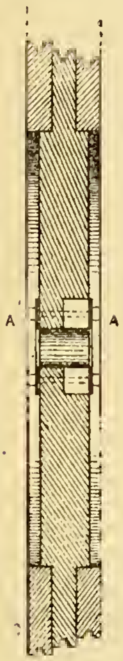


FIG. 40.—SECTION OF FLYWHEEL. One-eighth full size.

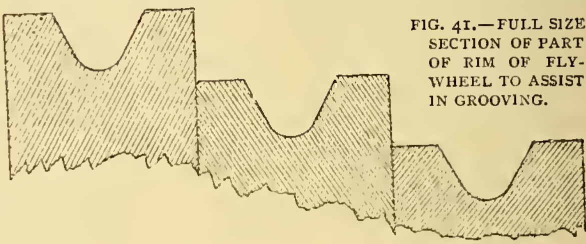


FIG. 41.—FULL SIZE SECTION OF PART OF RIM OF FLY-WHEEL TO ASSIST IN GROOVING.

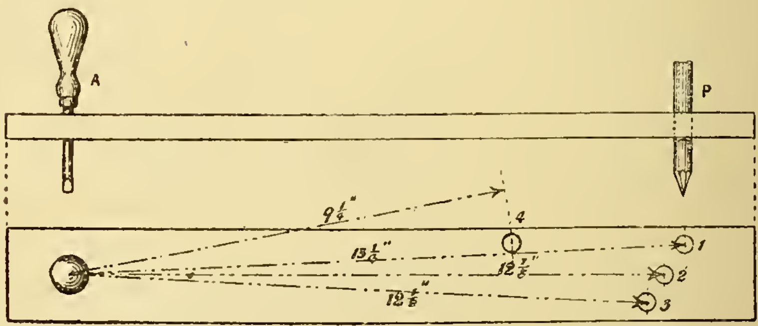


FIG. 42.—TRAMMEL FOR STRIKING OUT SEGMENTS. One-fourth full size.

For guidance in putting the members of the rim together, especially the first layer, mark out on anything convenient—bench-top, table, or floor, if the latter is fairly level—a circle equal in diameter to the inside of rim. Across this circle draw two diameters at right angles to each other, thus dividing the circle into four equal parts; these diameters to be produced three or four inches beyond each point in the circumference. Commence with the segments forming largest speed. First, fit one to the marks by "shooting" the ends until they agree with the radial lines embracing one quarter. Having done this, place the segment carefully in position, putting weights upon it to prevent it from being accidentally shifted. Now proceed to fit another against it, keeping to the marks, and so on, securely weighting each in succession until the four have been fitted, the last one of the series being fitted nicely between the first and third. Care must be exercised throughout to ensure that each joint is made close and perfect.

We are now ready to glue this portion of the rim together. Put a slip of paper under each joint to prevent the segments from sticking to the floor. Securely weight down two opposite segments, driving a few nails into the floor close against the inner and outer edges of each segment; this is to further guard against their being shifted. Remove the free segments, one at a time, and apply glue to the ends of each, and also to the fixed ones. Immediately after the glue has been applied, "rub" the segment tightly

into place, giving it a few light taps on the edge with a hammer. Weight it down securely and pass on to the next. The glue should be used as hot as possible, applied with a brush and well rubbed into the end grain of the timber. After weighting down, wipe off all superfluous glue, and let the joints dry thoroughly, after which the upper face of the whole should be "faired" off with a smoothing plane, and "combed" with a tooth plane—if such a tool is at hand—so that it may "take" the glue better in fixing the next layer. Fig. 37 shows the appearance of the rim at this stage.

The arms must now be fitted in place and divided equally between the butt joints of the first portion of the rim, as shown in Fig. 38. Each arm is secured by two screws in the position shown. Glue may be used in conjunction with the screws, but it is not absolutely necessary. The positions of the screws should be uniform, and must be noted for reasons which will be better understood later on.

The next layer of segments forming the second speed must now be fitted nicely between the arms and glued. Screws may be inserted into each segment as shown, to further secure and stiffen the whole. The positions of these screws should also be noted on the outside, so that they may be steered clear of in screwing down the next and last layer of segments forming the third speed. Before laying on the last speed the face of the second, or present one, should be planed fair and combed, and in order to admit of this being done, the screws should be driven in below the surface of the wood. Fig. 38 shows the appearance of the rim and arms at this, the second, stage.

The third speed may now be fitted and glued in place; and if screws are used, this may be done immediately after the second speed has been completed. Nails might be used instead of screws, but the latter are much more efficient and well worth the small additional cost. The third speed should also be secured by means of screws, as shown, two in each end and two in the middle of each segment. Those in the middle secure the segments to the arms, and there being already two screws in the end of each arm, the necessity of having their positions noted so that they may be avoided, will now be understood. Fig. 39 gives a view of the wheel at this, the last, and, as far as building goes, the complete stage.

Fig. 40 is a section of the flywheel when completed. An examination of this view will assist a comprehension of the foregoing instruction. On the right hand of this figure a full size section, Fig. 41, of part of the rim is given, so as to facilitate the process of turning and grooving the flywheel. Instructions for carrying this out will be given presently.

Fig. 42 is plan and elevation of a makeshift for a pair of compasses, or trammel, required in striking out the template for segments of rim. It consists of a piece of wood about 16 inches long, by 2 inches wide, and $\frac{1}{2}$ inch thick. A small bradawl is fixed in one end, as shown, to form a centre on which the trammel may be revolved. In the other end, at the various distances figured 1, 2, 3, and 4, holes are bored for the reception of a lead pencil, or steel scriber, wherewith the required outline may be traced. Of course, the pencil or scriber must fit tightly in these holes. The figured dimensions given are for the template, and, with the exception of Number 4, allow for finishing.

We may now consider the flywheel as being ready for keying on the crank shaft. For this purpose, two keys, similar in form to that figured for the cone pulley on mandrel, and each about 1 inch long, by $\frac{3}{8}$ inch wide, and $\frac{1}{4}$ inch thick, may be employed, one driven in on each side. The main object is to set the wheel so that it will run true sideways and on the inside of rim. This may be partly accomplished by manipulating the keys, slackening one and tightening the other, as may be found necessary, or by slackening and adjusting the centre plates, clearance for this purpose being allowed in the bolt holes. A flat should be filed upon the shaft for the keys to bed upon, and on the final setting of the wheel they should be driven in tightly.

The wheel is now ready for turning and grooving; this must be done in place, after the treadle has been fitted. A wooden rest must be rigged up, and secured on the floor, and motive power, for the turning, supplied by a friendly foot, requisitioned for the purpose. A detailed description of the rest, will, I think, be unnecessary. A glance at the one figured by AN OLD BOY, at page 153, Vol. III., will show one way of getting over this matter, and the intelligent amateur may readily extemporise other means. A piece of wood, fixed to overhang four or five inches on the top of an old box of suitable height, will answer first rate. If the box is light, it may be ballasted with stones, flat irons, or anything else handy, or failing weights, it may be "sat upon," or screwed to the floor.

Treadle.—The understanding and construction of this part will be a simple matter. It is carried by common long hinges, such as are used for chests. The framing consists of a back piece, shown in Fig. 43, into which three arms, Fig. 44, are tenoned. On the outer ends of these arms, the foot-board, shown in Fig. 45, is secured by screws.

To make the back part of the frame, a piece of timber slightly over 3 feet long, and $3\frac{1}{8}$ inches square in the rough, will be required. It must be planed up to the section shown in Fig. 43, which, as will be seen, is bevelled on one side—the back—so that the treadle may, if disconnected, lie upon the ground without

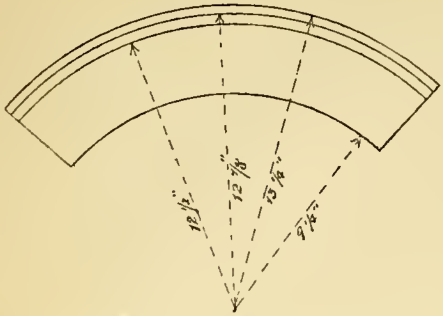


FIG. 36.—MOULD OR TEMPLATE FOR SEGMENTS OF RIM.

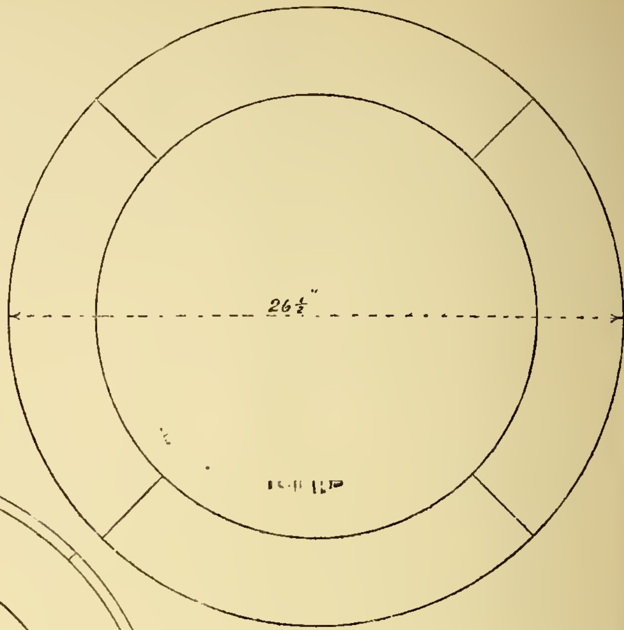


FIG. 37.—FIRST STAGE OF BUILDING FLY-WHEEL.

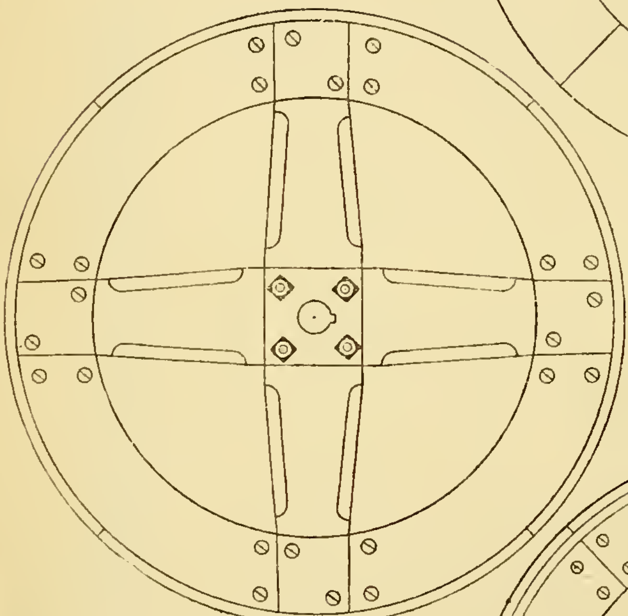
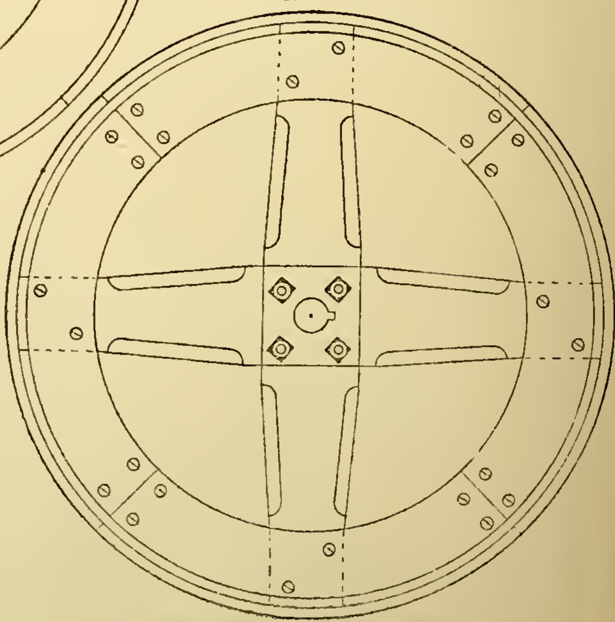


FIG. 38.—SECOND STAGE.

Finished diameter of First Speed = 26 inches.
Finished diameter of Second Speed = 25¼ inches.
Finished diameter of Third Speed = 24½ inches.

FIG. 39.—THIRD AND LAST STAGE.



Note.—All Figs., except Fig. 34, drawn one-eighth full size, or 1½ inches to a foot.

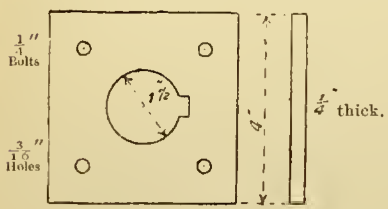


FIG. 35.—PLATES FOR ARMS.

FIG 34.

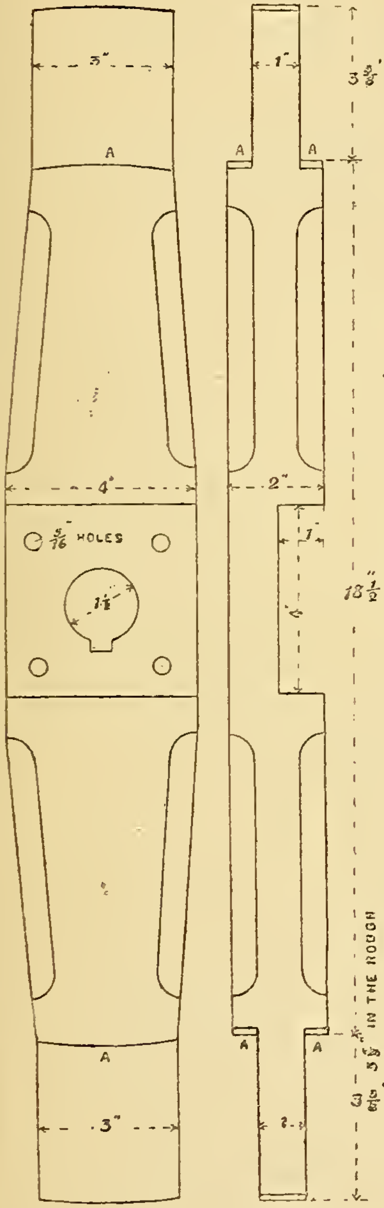
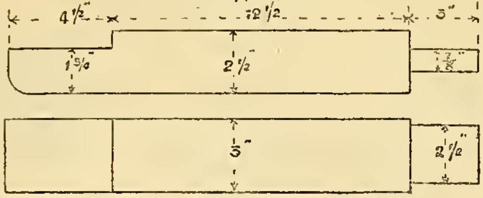


FIG. 44.



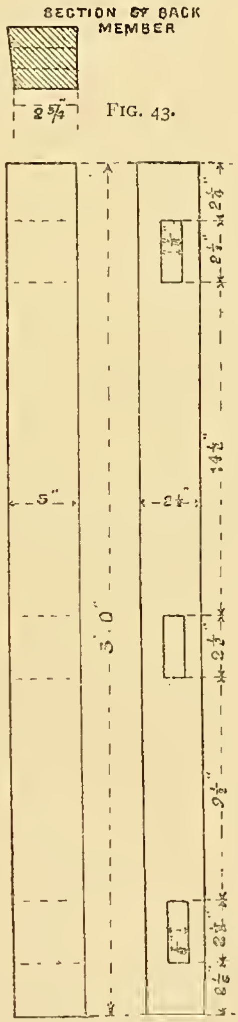


FIG. 43.

FIG. 45.

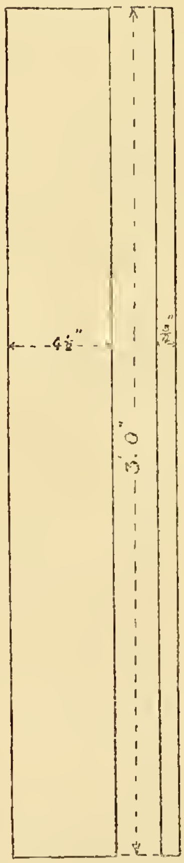


FIG. 46.

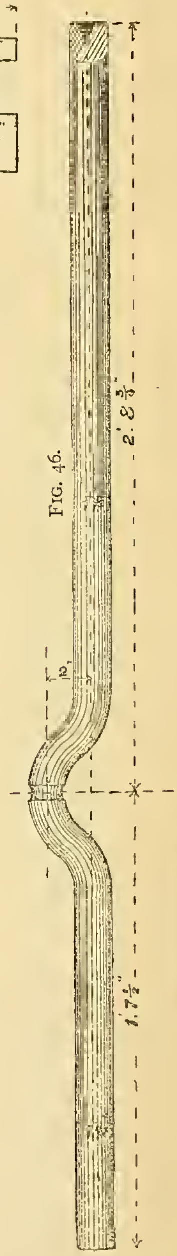


FIG. 34.—DETAILS OF FLYWHEEL ARMS.

FIG. 43.—BACK MEMBER OF TREADLE FRAME.

FIG. 44.—ARMS OF TREADLE.

FIG. 45.—FOOTBOARD OF TREADLE.

FIG. 46.—CRANKSHAFT.

Note.—All figures drawn one-eighth full size, or $1\frac{1}{2}$ inches to a foot, except Fig. 34, which is drawn one-fourth full size, or 3 inches to a foot.

straining the hinges. The size and positions of the mortise holes for arms is fully given by the figured dimensions, and call for no remark, except that care must be taken that they all lie in the same plane, fair with each other, so that the arms when inserted shall also correspond.

To make the arms, of which there are three, we shall require for each, a piece of stuff $20\frac{1}{2}$ inches long, by $3\frac{1}{8}$ inches wide, and $2\frac{5}{8}$ inches thick, in the rough. Plane up to maximum dimensions in section, then mark and cut the tenons, fitting in back part of frame, and recesses, or steps, for footboard. In the middle arm, immediately under the crank and centre of shaft, a hole, of about $\frac{5}{8}$ inch or $\frac{3}{4}$ inch in diameter, must be bored for the reception of a cord, by which the treadle and crank are to be connected. In the Folding Sheet, a hook and S link is shown. If this is adopted, a staple to take the link may be driven through, and clenched on the underside of the middle arm ; but the alternative form already mentioned, namely, cord, is a very cheap and handy substitute, out of which a great deal of work may be got before it requires renewal. In application, it is simply passed over the crank, both ends being brought through the hole in the arm and knotted on the underside. Hard cord or rope $\frac{3}{8}$ inch in diameter may be used. Stout leather thongs are also suitable for the purpose, and so is iron wire.

The footboard is 3 feet long, by $4\frac{1}{2}$ inches wide, and $\frac{3}{4}$ inch thick. It may be made of spruce, which material will also do for the framing of the treadle. It is fastened to the arms by means of wood screws, two in each, after they have been glued and wedged into the back part of frame.

The treadle is now ready for the hinges. These can be procured at any ironmonger's shop. They should be strong, and of good length. They may be let into the framing, but this is not absolutely necessary. Fasten them to the treadle first, then set the latter in position, so that the centre of the middle arm falls exactly under the centre of the crank. This satisfied, fix the hinges to the back stay or tie bar, and the treadle is ready for work.

Fig. 46 shows the crank shaft, about which I shall have more hereafter, when the iron and metal work of the lathe is treated upon.

The next chapter will be devoted to a description of the socket for T-rests, and also to the "poppit" head, and other details. I had hoped to be able to complete my instructions for building a wooden lathe in four chapters, but as the description has run to a greater length than I supposed it would, and as it is necessary to be clear on every point, I trust I shall be held excused by my readers.

(*To be continued.*)

MOUNT CUTTING; AND ALL ABOUT IT.

By AN OLD HAND.

II.—BRONZE OR GILT MOUNTS.

To form bronze or gilt mounts, cut your mount as before described ; it does not, of course, matter about the card being clean, as long as it has a good smooth surface. Take your glue and strain it through a piece of fine linen or muslin, so that it contains no grit. With a clean brush spread the glue over the mount thinly and evenly ; let it remain a few minutes until just sufficiently tacky, and be careful you do not leave a small pool of glue, but that it is evenly and thinly glued, then through a fine sieve cover every part with bronze powder, and when thoroughly dry the remaining powder may be shaken off into a sheet of paper, or brushed off with a soft brush. I should advise the amateur to be very careful in using this bronze, as it is exceedingly dangerous ; and if he is residing in any town, or within easy distance of a town, these bronzed boards may be bought ready for use at a very low price. Of course, for use in small towns in the Colonies, where they are not easily obtainable, the bronze powder (kept in an air-tight bottle) will keep for any length of time ; and the bronze boards, if bought and only required occasionally, should be always kept tied up in three or four sheets of paper, so as to exclude the air as much as possible. When a mount is cut from a bronze board that has been bought—I may remark when bought they are usually after being bronzed and dry put through a roller with heavy pressure, which presses the bronze smooth evenly—it requires binding with gold paper, and a line can be made with a piece of blunt wood, or thick paper-knife, or edge of penny, or spoon handle. Place your rule on mount about $\frac{1}{2}$ inch from opening, and with spoon handle or latch-key handle press heavily, which will form a semi-bright line round. I will briefly describe the manner a professional bronzer does his work, by way of caution to amateurs not to use this deadly poison too lightly. In the warehouse there is generally a room called the "bronzing room," and when any man is working there—and he does not stay there for more than an hour at a time — the draught is thoroughly excluded, that the powder may not blow about. He is dressed in a long oilskin jacket, fastened at the waist with a belt, and gloves fitting on to this sort of smock ; his ears, nose, and mouth are bandaged six or seven times round, and he also wears a pair of shell spectacles and close-fitting cap, so that, to all appearance, he looks like a diver. He is allowed as much milk as he chooses to consume.

This powder is very dangerous if it gets into a cut finger, or to inhale. The reader must pardon me for going from the subject, but I think it best to explain the above, to show those who may read this article, and are ignorant as to the kind of stuff they use, how very dangerous it may be to have anything to do with it.

You can obtain bronze or silver powder at any oil and artist colourman; boards, ready for use, of any wholesale cardboard makers, mount-cutters, and picture-frame makers, as I have before mentioned. I have found the best and cheapest man to get the powder or boards ready, bronze or silver, gold leaf or veneered wood boards, in oak, walnut, dark oak, maple, ready cut or for cutting, or anything you require not really connected with this special article, you can get procured for you better, perhaps, than if you go up to town yourself. I am now alluding to those who live in small towns, like myself. I read the various articles in AMATEUR WORK, but I find very often that I cannot carry them out for want of a few simple articles not procurable in my town. I have written and obtained even the most trifling articles (the last thing I got was some ½ inch brass screws, value 2d.) from Gus Rochefort, 29, *Basinghall Street, London, E.C.*

The mount for gilding is usually cut in thick cardboard, twelve sheet being double the usual thickness, so that it does not curl in the preparation. The tools used in gilding, namely, the cushion, bob or presser, knife, and hair tip, are illustrated in Vol. III., page 49, of this magazine, to which the reader is referred, if he wishes to see some good representations of them. The cushion is intended to keep the leaf from any sudden gust of wind: even the breath will cause the leaf to curl up, and try your patience very much to get it straight again. To make it, take a piece of wood about 12 in. by 6 in., tack a loop of leather—a bit off a piece of wash-leather will do—to put your thumb through; get two or three pieces of old flannel, and place evenly on the board the reverse side of the loop, then cover the whole with wash-leather, tacking it round the edge of the wood, so as to form a soft but smooth cushion. Round one end of the cushion, and about half the length of each side, tack a piece of old parchment or stiff foolscap paper, to form a shield, as shown in the illustration of the cushion to which reference has been made. The tip can be bought at a very low price, and does not pay to make. I think you can buy it for 3d. or 4d. The bob is a piece of flannel wrapped in wash-leather. For the knife you may use, if you like, the back of an ordinary table-knife, but particular care must be taken that it is perfectly clean, and it must not be touched by the fingers.

Owing to the extremely thin and fragile nature of gold leaf, the slightest breath will curl it up. The best mode is to lay your book on the bench, and with the left hand press a rule firmly on, so that it does not shift, and cut off the stitched part at the back, so that the top leaf of paper can be removed with a knife, keeping the whole book, after cutting, in the cushion; then, with the tip in the right hand, pass it over the hair of your head, so as to give it the slightest touch of grease; then lay it flat on the leaf, which can then be readily removed, and placed on the work which is ready to receive it.

After cutting our mount as described, pin it on the bench, or on a board, to keep it flat, then size the part to be gilded once, or even twice, with patent size, or common size, if none of the other is at hand. When dry, spread on it evenly, with a soft brush, some oil of gold size; let it nearly dry, or remain till it is just tacky or slightly sticky to the touch, and then apply the gold leaf, allowing each leaf to lap a little, so that not a part is missed. When well covered, press it down with the bob. If any separation between the leaves shows itself, it is as well to retouch with oil of gold size the parts that show, and cut the leaves in strips—which may be done in the book—and they may then be taken up with the paper, as the gold adheres to the cut edge, and well covering the parts prepared. When dry, take a little clean parchment size, and after well straining through linen, that not a particle of dust is in it, size the whole of the gold over, and let it dry. When this has been done our mount is ready.

Veneer Oak Mounts, showing the grain, are very pretty and effective. When the wood mount is cut, pin it down to the board as before, apply clear size thinly over the edge to be gilded. When dry, touch over with oil of gold size, and gild as before. Any other wood may be treated in the same manner. For example, suppose we wish a wood mount and frame for an oil painting, so that the whole is washable: after applying clear size, oil of gold size, and clear size again, take a little crystal white-paper varnish in a clean cup, and with a camel-hair brush varnish the whole of the gold over; let it lay flat for a few hours till dry, in a place where there is *no dust* that can stick to it. When thoroughly dry, you can sluice it with cold water, and your frame and mount will look bright and clean, and can be washed when desired with a soft sponge, and will last, I may say, for a century.

Veneer Wood Mounts.—For these, take an ordinary card, and procure a piece of thin veneer of any kind desired—oak, maple, walnut, etc. Damp the veneer well with warm water. This work should be done in a warm room. Glue the card well over, lay the veneer on it, and rub it firmly down with as much

pressure as you can give it. Should the glue get too cold, or your wood be obstinate, have a flat iron ready warm, and iron it down, using as much pressure as possible. Put a piece of linen over the work first, or the ironing may make the wood glossy. Put the board under a weight, or in a press, so that it may be under pressure till thoroughly dry, which will take a few days; then take it out, and proceed as before in cutting and binding. The bevels, if preferred, may be bound with paper of any colour that suits the wood.

Plush or Velvet Mounts.—With regard to mounts of this kind, I may point out that a claret colour plush mount and gold frame looks well for photos coloured with crystoleum; or an old gold colour plush, with black frame, makes a very pretty contrast. When the mount is to be covered with plush or velvet, there is no necessity to be so particular about the bevel, as long as the opening is cut true. After cutting the mount, say an oval, lay the plush or velvet smoothly on a table, place the mount on it, and mark it round the opening, remove and cut the material about $\frac{1}{2}$ inch within the mark, so as to allow enough to turn under; then nick it with the scissors about $\frac{1}{2}$ inch apart within $\frac{1}{8}$ inch of the mark. Lay it smoothly again on table, and glue the mount well over. Let a minute or two elapse before placing the mount on the plush, etc., so that the glue may not be in a fluid state on the mount, as it may ooze through, especially in velvet. When the glue is partly set, lay the mount on the material over the opening, so as to meet the line previously made, then turn it over with the plush adhering to it, and dab the plush down with a cloth. Do not rub to and fro, as this will spoil the appearance of good plush. Dab it or smooth it firmly the right way of plush, which is seen by trying both ways. When well rubbed down, lay it down back upwards, and glue the edge of the opening, and turn the nicked parts over carefully, and see that it is evenly done, or your opening will be sadly out of shape. In this way any mount or frame can be covered with plush, velvet, leather, or any material.

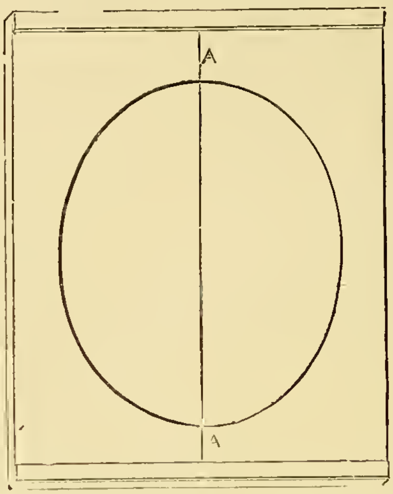


FIG. 17.—MOUNT SHOWING SLIP GLUED ON TO PREVENT WARPING. A, A, Slips.

Wood Mounts.—When any of these are required, we must first get a piece of wood—mahogany, deal, oak, etc., or whatever kind may be determined on. If, for example, it is desired to cut a large oak mount, procure a good wainscot oak board, and cut it to required size. If the opening necessary to *show* off our object is 26 inches by 18 inches, and we want a 3 inch mount at narrowest point, we must cut our board 32 inches in length and 24 inches in breadth. The boards run, as a rule, 12 inches wide and $\frac{1}{2}$ inch thick; and as it is desirable to have a neat join after gluing, I find it best to glue and nail two slips on, as shown in Fig. 17, at the edge of the boards, at A, A. When trued and square, strike the oval, as explained in the preceding paper, but with this difference—mark your oval 26 inches by 18 inches; then make another knot in your twine $\frac{1}{2}$ inch longer, which will mark another line 27 inches by 19 inches; bore a hole in the inner line, and cut it out evenly with fret-saw or key-hole saw, as shown in Fig. 18, and clean it round very exactly with coarse glass-paper on a slip of wood, then with the spoke-shave make your bevel, holding it in both hands, working the edge evenly down until within $\frac{1}{32}$ inch from both edges, and then clean round with glass-paper on stick, and finish smoothly with finer one.

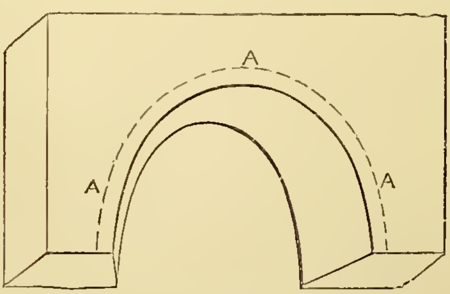


FIG. 18.—MODE OF CUTTING BEVEL IN MOUNT. A, A, A, Pencil line as guide for correct bevelling.

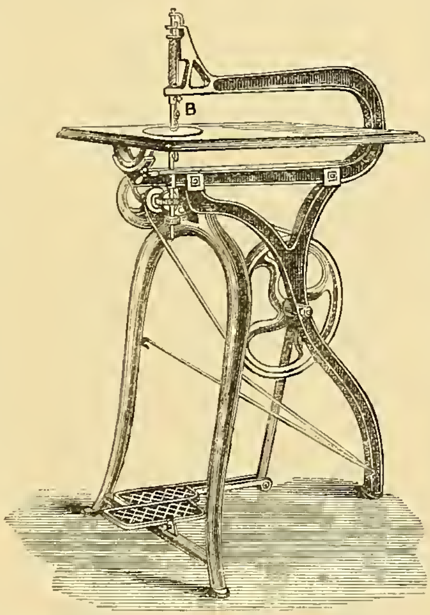
I think I have now brought under the reader's notice every point with regard to mount-cutting on which information may be required, and I therefore bring my remarks to a conclusion, trusting that all who try their hand at the work may find as much pleasure, and even profit, in it as I have; for, after all, money saved is money gained, and by doing the work myself I have saved, and therefore gained, the money I should otherwise have paid for professional assistance. That it is only taking care of the pence in the case under consideration, I am willing to concede, but experience has shown that great results often spring from little causes, and that the first tendency to be saving has sometimes resulted in amassing a fortune.

NOTES ON NOVELTIES.

By THE EDITOR.

50. BRITANNIA CO.'S NEW REGISTERED FRET SAW, NO. 7. 51. LEICESTER UTILITY CO.'S "TRIPOLINE." 52. LE PAGE'S LIQUID GLUE. 53. REVIVAL OF BRITISH INDUSTRIES. 54. CORDNER, ALLEN AND CO.'S LIST.

50. THE BRITANNIA COMPANY'S NEW REGISTERED FRET SAW, No. 7.—The Britannia Company wish to call attention to their New Registered Fret Saw, a machine which puts advanced fret-cutters and cabinet-makers at once in the position of providing themselves with a strong and serviceable saw, capable of doing larger work than is generally done in machines of this description. It is possessed of many advantages, among which that which is afforded by the table occupies a prominent place. Generally speaking fret saws are furnished with a raised platform, on which the wood to be cut is placed, but this has an oblong table, flat and extending the whole length under the arm, which affords ample room for the execution of work of large size. The table measures 20 inches from the saw to the bend of the arm, and tilts to any required angle, a desideratum in cutting inlaid work. The saw has a true vertical stroke, which is an essential for cutting smoothly and easily, and is fitted with a durable and efficient blower: a presser-foot, shown at B in the accompanying illustration, which can be quickly adjusted to suit any thickness of material, bears on the wood and overcomes any tendency on the part of the work to jerk upwards, a fault which often causes breakage of saws. The fixing of the saw is rendered all the more easy by the removal of a loose round piece shown in the illustration under B, which affords a clear and complete view of the lower saw bar. Further, the machine is fitted with a hollow drill, not shown in the illustration, and the drill shaft is so constructed as to carry emery wheels, buff wheels, or polishing brushes. The price of the machine, with saws, spanners, drill, etc., is £2 15s. Polishing brushes of suitable size are supplied at 1s. each, drills at 1s. per dozen, and emery wheels at from 1s. to 4s. each.



THE BRITANNIA COMPANY'S NEW REGISTERED FRET SAW, NO. 7.

51. *Leicester Utility Company's "Tripoline."*—I can speak in terms of warm commendation of "Tripoline," a metal polish for brass and all kinds of metals, manufactured and sold by the Leicester Utility Company, 10, *Yeoman Lane, Leicester.* I have made trial of it on some mathematical instruments, sadly tarnished by long and frequent use, and was surprised to see the result obtained by applying a little of the paste, according to the directions for use, with a wet rag, and polishing with a dry one. It is certainly an excellent material for imparting a brilliant polish to metallic surfaces quickly and with very little trouble. All who have brass and metal articles to clean and brighten should try it. For household use it is supplied in the form of paste, in boxes at 1d., 2d., 3d., 6d., and 1s. each, and sold by all ironmongers, oilmen, druggists, grocers, etc.; for engineers, brass finishers, tinplate workers, etc., it is supplied in the form of powder, a better form for large users, in casks containing half cwt. and upwards, at the rate of £7 per ton. It is infinitely superior to rottenstone, and is said by the makers to produce a better and more lasting effect.

52. *Le Page's Liquid Glue.*—So many amateurs have borne testimony to the value and excellence of this admirable glue in "Amateurs in Council," that it is almost superfluous again to direct notice to it. I may, however, remind my readers that it is incomparable for cementing leather, glass, crockery, marble, broken ornaments, etc., as well as wood, and that the agents for its sale in this country are Messrs. Phillips and Co. (late T. Eckhardt), 96, *Milton Street, Chiswell Street, London, E.C.*

53. *The Revival of British Industries* is the title of a pamphlet which may be read by advantage by all who take an interest in the approaching General Election. I do not say that everything proposed in it is practicable, nevertheless it deserves careful consideration. It is written by "A Candidate;" published by Mr. James Bolton, Bookseller, *Knightsbridge*, and sold singly at 2d., or for distribution, 10 copies, 1s; 100 copies, 9s.; 500 copies, £2, post free.

54. *Cordner, Allen and Co.'s List of Electrical Apparatus, etc.*—Readers of this Magazine who have any hobby in which electricity may be called into play as a motive force or agent for producing certain effects, should provide themselves with the very useful and comprehensive "List of Electrical Apparatus, Lifts and Hoists, Water Softening Apparatus, Chemicals, etc.," issued by Messrs. Cordner, Allen and Co., Limited, 20, *Bucklersbury, London, E.C.* The prices of accumulators of various kinds, batteries, electric bells and fittings, dynamo machines for incandescent lighting, steam engines and boilers, gas engines, electric lamps, motors, cables, wires, chemicals, etc., and other specialities of the firm, will be found in its pages. Applicants should send a 1d. stamp for postage.

AMATEURS IN COUNCIL.

1. *Contributors to* AMATEUR WORK *and Correspondents asking or answering Questions in "Amateurs in Council," are requested to write on one side of the paper only.*

2. *When Illustrations or Diagrams are necessary, draw them on a separate piece of paper, because the "copy," as the manuscript is technically called, has to go to the printer, and the illustrations to the engraver.*

3. *Abstain from the epistolary form, as it is utterly unnecessary, unless in letters of business. Put the question you wish to ask, or the reply you wish to make, as briefly as possible, and write every separate question and every separate reply on separate pieces of paper. Sign each with initials, nom-de-plume, or name and address, as preferred.*

4. *Let every paper be headed* AMATEUR WORK, *and follow these words with* "Information Sought," *when it is a query;* "Information Supplied," *when it is an answer to a query; and* "Sale, Purchase, and Exchange," *when it concerns anything to buy, sell, or barter.*

5. *It must be fully understood that no attention will be paid to any letter or communication in which these rules are not rigidly observed.*

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine, the information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

The "Coventry Chair."

*** Messrs. STARLEY & SUTTON, Meteor Works, *West Orchard, Coventry*, favour me with a reprint from "The Tricyclist" of June 26th, 1885, of "a remarkable ride" accomplished on a machine manufactured by them, and called the "Coventry Chair." It is too long for insertion here, but I may mention that the machine carries a passenger and luggage, as well as the motive power. I use this term as a compromise, for I do uot know whether I ought to say rider or driver. The "Chair" appears to be a most desirable machine for family men and kind-hearted sons and brothers who like to treat others to a ride as well as themselves.

Ink Making.

E. R. T. P.—If you will consult the indexes to Vols. I., II., and III., of this Magazine, you will find various recipes for making inks, taking out ink stains, etc.; and further recipes for copying ink were given to AMATEUR INK MAKER in page 499 of this Volume, which will in all probability serve your purpose.

Davey Safety Engine.

S. M. L. (*Goderich, Canada*) kindly sends me particulars of the "Davey Safety Engine," which he thinks is somewhat similar to the "Shipman" Engine. This engine is manufactured by Messrs. Chas. P. Willard and Co., 284, *Michigan Street, Chicago, Ill.*, in five sizes of ½, 1, 2, 4, and 6-horse power respectively, supplied at 125, 175, 250, 400, and 500 dollars. It requires no engineer to look after it, and in it there is no steam pressure, no exhaust, no cylinder lubrications, no offensive odours, and no possibility of explosion. It is said to be a motor that is specially desirable where a small, cheap, and positively safe power is required. It is a steam engine, but differs from steam engines in general use, because steam is not the motive power employed to do the work, and only as much is required as would be generated in an ordinary tea-kettle, and this at only atmospheric pressure; and it is without safety valve, steam gauge, gauge cocks, boiler feed pump or injector, or any of these adjuncts of an ordinary steam engine. The cost of fuel is ½d. per horse power per hour. It is stated to be superior to the hot-air engine, because "it is three or four times as powerful," and superior to the gas engine, "because the cost of fuel is only one quarter as great;" it is much simpler in its mechanism, and it may be put into less skilful hands. The prospectus states that it owes its origin to Mr. Henry Davey, an English engineer, the inventor of the "Differential Pumping Engine."

Model Engine and Boiler.

A. F. S. (*Dresden*) writes:—"In page 453, in the first column, and the 14th line from the bottom, there should be a full-stop after "heavy." All the boilers should have two safety valves. Fig. 2 is not suitable for high pressure compound engines. It was designed for a low pressure condensing paddle engine, in which the pressure rarely exceeded 15 lbs. The furnaces were 3 inches by 3½ inches. I always put the dome in the smoke box if possible. If the steamer is to carry sail, let 1¾ inch to 2½ inches of water cover furnace. Beware of long furnaces as the fire burns only in front. I had one in a boiler once that was 5 inches diameter and 10 inches long, and it made a great improvement when I cut 2½ inches off it. Regarding S. M. L.'s query I can only say that I sin in company, as OLLA PODRIDA does not clearly understand what is required, and I cannot know by inspiration. The query is too vague.—[Sinuing in company is no excuse for sinning. Moreover, it is by no means clear to me that you do sin in company, for OLLA PODRIDA answers S. M. L. (*Goderich, Canada*) to the point, and merely asks him if he wants further advice to state his case very plainly. I never said that you could know by inspiration: I wish you could, with all my heart. I only asked that evidently being uninspired you would not attempt to prophesy. Hosea Biglow's wholesome advice to all men is "Never prophesy unless you know."—ED.]

Castings for Planing Machine.

A COUNTRY AMATEUR writes:—"I have some idea of getting up patterns for castings of a machine, suitable for amateurs, 6 feet, or 6 feet 6 inches, by 16 or 18 inches wide, and 16 or 18 inches high, to plane wood or light iron. Estimated weight of castings, 12 to 15 cwt. Castings would cost from 12s. to 16s. per cwt., from our own patterns. If three or four amateurs would like to join in getting up the patterns and castings, and having them planed, the cost would be much less for each, and far less than they can be bought. I would superintend making of patterns, and having a small planing machine could correct and improve upon its plan."

Hydraulic Motor for Amateurs.

F. R. F. (*London, W.*) writes in reference to CATO'S "Hydraulic Motor for Amateurs," Vol. III., page 502:—"Would not this motor work better if the supply pipe were placed nearer the top of the wheel, so as to make it overshot instead of half breast (partly), as it is shown? I have made one from directions given, and find it works best with supply pipe higher. It has a fall of 40 feet and drives dynamo."

Bookbinding.

FENMAN.—You are either using bad glaire or you have uot properly prepared the back of the book for finishing, or you have not taken your type hot enough. The back must be prepared, say twice, with glaire, allowed to get dry, then laid on with gold leaf; with the type well heated worked with an even pressure, and the surplus gold afterwards wiped away. — AUTHOR OF "BOOKBINDING FOR AMATEURS."

A. V. P. (*Islington*).—The papers on "Bookbinding for Amateurs" appear in Parts 6, 8, 10, 11, 12, 16, 18, 21, to be obtained of any bookseller, or of the Publishers, at 6d. each.—AUTHOR OF "BOOKBINDING FOR AMATEURS."

Fat for Soap-Making.

A READER FROM THE FIRST.—If you cannot save enough waste at home for soap-making you had better purchase fat of the butchers. It is your best chance of obtaining it in moderately small quantities.

Sweetland Chuck.

A. F. S. (*Dresden*).—As you are perfectly well aware, you can get a "Sweetland" Combination Chuck of Messrs. Charles Churchill and Co., 21, *Cross Street, Finsbury, London, E.C.* You show that you know where the chuck in question is to be obtained by adding to your query, "I have not written to Messrs. Churchill because I wrote to them some time ago on the subject of scroll chucks, and I received no answer, and a friend of mine wrote with like result, so it is not very encouraging." I am in no way surprised at your getting no answer to your letter from Messrs. Churchill and Co. With regard to the "principal" on which the Sweetland Chucks work, seven illustrations of the chuck, and a very clear description of its mechanism, are given in pp. 66 and 67 of Churchill's latest catalogue, and to this I must refer you, though, no doubt, you will regard my reply in much the same light as Messrs. Churchill and Co.'s disinclination to answer your letter about the scroll chucks.

Home-Made Furniture.

J. T. F. (*Brixton*) is informed that in "How I Furnished My Snuggery," which will form Part III. of "My Furniture," a design for a bookcase has an early place. Examples of the other articles mentioned will occur later on. M. M. is accustomed to finish oak by rubbing over with boiled oil, and a few hours later well brushing with beeswax and turpentine. Here is a receipt for mixing the polish: Beeswax, 1¼ lbs.; resin, 5 ozs.; turpentine, 1 pt. Set in a place warm enough to melt the ingredients to the consistency of cream.—M. M.

Folding Chairs, etc.

D. D. (*New Quay*).—(1) Your wish for instructions for making folding chairs of different kinds shall be complied with as soon as opportunity offers. (2) There are no books published that treat entirely on the manufacture of chairs and screens. (3) You will find the names and prices of books issued by London publishers in "The Publishers' Circular," Sampson Low & Sons, *Fleet Street, E.C.*, and "The Bookseller," Whittaker, *Warwick Lane, E.C.*, both published monthly at 6d. For books published many years ago, refer to "The London Catalogue."

Type Founding.

Fenman.—In riveting the different parts of mould for type founding, common wire was used, a little thicker than the drill with which the holes were made; the end of the wire was tapered with a file till it fitted the hole well, and after being struck firmly into the hole, the wire was cut off, leaving only as much as would form a rivet head on both sides. No heat was required in constructing the mould, except in forming the slide lever, shown in Fig. 10, and described in page 374.—J. R.

T. W. H. (*Openshaw*).—The piece of wood used to barricade the front of funnel is simply a bit of a cigar box, about quarter inch thick, one and a half inch wide, and about two inches long, only the length will depend on how far there is between F and C. Place one end of the wood against F, and cut the other end to such length as when pushed down firm against C it will come near the place marked ×, Fig. 18, page 417, the funnel will thus be kept close, and allow it to swing on its hinge, N. The piece of wire or nail is fixed in one corner, and projects from the wood somewhat like the blade of a penknife half closed, for picking out the block of metal from the funnel. I thought of having a double rebate on block, Fig. 20, but found it did not tie so firm at the ends when cutting nicks. I notice a typographical error at page 374, the strip of iron, J, Fig. 1, should read $\frac{1}{8}$ inch thick, instead of $\frac{1}{16}$ inch thick.—J. R.

Shocking Coil.

Flashing Dynamo.—This correspondent desires instructions for making a shocking coil with regulating tube or core, and says: "If I withdraw the core it weakens the secondary current, naturally, because the core, which is an electro-magnet, has no influence over the wires when withdrawn." You are right, and having got so far in gripping the principles of construction, it will be quite easy to apply them by one of the following means: 1. Make the core to slide in the tube over which the primary is wound. The tube should be of thin ebonite, and the core should fit this easily. A part of the primary must be wound around a small electro-magnet outside the coil, and this outside magnet be furnished with a breaking spring, hammer, etc. 2. Make a thin brass tube to slide over the *fixed* core, between that and the internal surface of the primary bobbin. This will check and regulate the inductive influence of the core until it has been withdrawn, and the shocks will increase in intensity as the sliding tube uncovers the core.—G. E.

Pill Box Telephone.

A Reader from the First has made a pair of telephones, as described by Mr. Sayer in an early Part of Amateur Work, but he cannot get them to work. As our Editor has lost sight of Mr. Sayer, I have been requested to furnish a reply. It appears to me that you have connected the two telephone wires to one line wire. This should not be done. You must have two line wires separate, and perfectly insulated from each other. The inside wire from one coil should be connected to one line wire, and the outside wire of the coil to the other line wire. At the other end the position of the other coil to the line must be reversed. Other minor matters requiring attention to secure success, are—See that the internal walls of the wooden box are quite smooth; see that the ferrotype plate is also free from wrinkles, and is stretched tight over the box. It must be gripped firmly all around the edges of the box. It may be necessary to slightly alter the distance between the plate and magnet, and so adjust the instrument to your voice. You say in your letter that you turned a recess in the lid of the box to fit the ferrotype plate, and, from your sketch, it would appear that quite a quarter inch of the lid touches the plate. This should not be. The recess should be so turned as to leave the plate free to vibrate in every part except the extreme edges, and then it should receive equal pressure all around. Unless such instruments are well and carefully constructed, they fail to clearly articulate speech, and most of amateur telephones require some peculiar tone of voice to make them work satisfactorily. The instrument made by you, can, however, be used with the transmitter recently described by me in Amateur Work, and, with this, should give satisfactory results.—G. E.

Utility of Amateur Work.

L. J. K. (*Dublin*) writes:—"From instructions given in Amateur Work I have constructed a work bench, made two cabinets, framed a great number of pictures for myself and some of my friends, made four chairs, and am constructing three more, made several wall brackets, and done quite a number of 'jobs' in carpentry, 'tinkering,' etc. I have also made a garden seat with an adjustable sunshade. Both seat and shade are from designs of my own (at least, I have never seen any like them). The shade is most easily adjusted, can be lowered or raised at pleasure, or can be totally detached, and no trace left of its ever having been attached to seat, in less than a minute. I cannot draw, or I would send you a sketch. For the encouragement of some parties who have 'no time' to do anything, I, perhaps, may say that I have no time to do anything at 'amateur work' until after seven p.m. When I bought the first number of Amateur Work I had never taken a plane in my hand! now I have the reputation of being 'awfully handy.' If one-tenth of the money expended on masher collars and cigarettes was laid out on wood, chisels, etc., how much more useful might young men be, both to themselves and to the community at large."

Decorative Birds.

W. H. C.—You can get books giving instruction in painting in oils and water colours of artists' colourmen, such as Messrs. Winson and Newton, G. Rowney and Co., Messrs. Reeves and Co.; but, as I have said, I am not aware of the existence of any series of copies of birds and flowers that are specially intended for copying on panels, from 4 inches to 9 inches square for cabinets, overmantels, etc. I fear, too, that even if you had such examples you might not be able to utilize them, unless you can draw correctly in outline and use your colours with good effect, for nothing looks worse than a badly painted piece of work doing duty as a panel or tile. There are many varieties of pretty and highly effective oleographs or coloured lithographs on sale, of birds, fish, etc., on a background in imitation of wood, that you might attach to the surface of your panel, etc., and then finish by varnishing, and I rather think that these would be more in your way. To obtain any of these I should recommend you to write to Mr. Gus. Rochefort, Picture Dealer and Picture-Frame Maker, 29, *Basinghall Street, London, E.C.*, mentioning the size and description of picture that you require, and he, being in the trade, and therefore thoroughly cognisant of every thing of this kind that is produced in the United Kingdom or imported from Germany, etc., will, I am sure, be glad to render you any assistance in his power, and supply them as cheaply as any house I know.

Rogers' Fret Saw.

J. W. H. (*Exeter*) writes:—"I notice in the article on 'Amateur Workshop,' by J. E. R., that he mentions the failing of the fret saw there mentioned. This encourages me to write you at length. For some time I have been using a 'Rogers,' that works very well indeed for small stuff, but when I want to cut, say $\frac{1}{4}$ inch, it is a failure, *i.e.*, in cutting a small hole the top cut will be perfect, but the under cut will be very small indeed, as ◯ top cut, ○ under cut. This is caused by the saw not having a perpendicular stroke. Seeing a fret saw advertised that claimed to have this 'truly vertical' stroke, I obtained one, but I find it is a failure, *i.e.*, the tension of saw is the fault this time. You are aware that the saw in a 'Rogers' can be tightened to a breaking point. In this new one there is only a certain amount of tension put on the saw as it fixed, which cannot be tightened. This may do very well for $\frac{1}{8}$ inch stuff, but I want to cut thicker stuff, not that I cut all $\frac{1}{2}$ inch stuff, but I put several thicknesses together, and cut several articles at once, which is a great saving of labour. What is wanted in a fret saw is the combination of the two—*i.e.*, the saw to be held by arms like the Rogers, but to work in guides. There is a decided and fixed force that pulls the saw down, but that which takes it up again is not so; otherwise, the idea as mentioned in page 292, Vol. III., would do. In short, what is wanted by all fret sawyers, is—firstly, truly vertical stroke; secondly, saw to be tightened that it will not give by the work being pushed against it." [Try the Britannia Company's Improved Combined Lathe and Fret Saw, or their new Machine described in Vol. IV., page 352.—Ed.]

"Una" Centre-Board Boat.

R. E. (*Dacca, East Indies*) writes:—"It would be a great boon to many of your subscribers in India and the Colonies, where yachting can be carried on, if they could build a safe good sailing boat. You have published working drawings of canoes, could you publish similar drawings of a 20 foot long 'Una' centre-board boat, such as are built by Messrs. Forrest and Sons?" [Will any correspondent, who knows the boat to which R. E. refers, kindly write and give such information on the subject as he can. I shall also be obliged for the address of Messrs. Forrest and Sons.—Ed.]

Cheap and Effective Circular Saw Bench.

S. S writes in poetic strain, although, as a rule, poetry is not admissible in a Magazine of so prosaic a tendency as AMATEUR WORK:—

"Lo! the poor amateur, whose untutored thought
Found this in print, and dear experience bought.

"*Vide* AMATEUR WORK, Vol. II., p. 543. 'We are about to introduce a cheap Circular Saw Bench, and at £5, *it is what many amateurs want*.' The Editor adds, 'The machine should be powerful enough to do much rougher work than can be managed with a saw mounted in a lathe.' Right, Mr. Editor, but does it? An amateur *wants*, soon may he find it, a machine that will cut 2½ inches at least; those I have seen will cut ¾ inch only with a 6 inch saw, and not drive a much larger. How is it that so much of the saw is absorbed by spindle, shoulder, and table, quite ¾ lbs. of the smaller sizes? I feel sure that if some good maker would produce a machine at a reasonable figure, that would meet the above requirement, he would not only be substantially rewarded for his enterprise, but earn the lasting gratitude of every amateur fortunate enough to procure one." [When I read S. S.'s opening couplet, I was led to think I had been unfortunate enough to induce him to spend a five pound note on a machine that did not answer his expectations, but my mind was considerably relieved on finding from the following portion of his letter that he was not actually a victim of misplaced confidence, but only the possessor of a want. My note in Vol. II., page 543, referred to the expressed intention of the Britannia Company to produce a cheap Circular Saw Bench that they hoped to sell for £5, orders permitting, and that in the interest of my readers I followed the announcement by giving briefly and roughly my idea of what such a machine ought to be in the words that S. S. quotes. Of course, I cannot take upon myself to say whether or not the Britannia Company have actually produced the Circular Saw Bench that they had in contemplation when their letter was written to me. Possibly their idea at that time ultimately found its development in their "New Circular Saw Machine," illustrated and described in Vol. IV., pages 352 and 353, by which cutting can be done up to 4 inches square. But then, again, the price of this machine, including three saws, is £15, or three times as much as the sum at which it was hoped to produce a cheap Circular Saw Bench. S. S. must live in hope, as I do. Amateurs generally want a circular saw that can be fitted in the work bench, working in a slot cut in it for its reception, and adapted for ripping up long pieces of timber that can be pushed up to it as the cut is made, guidance of the wood being effected by a fence that can be attached to the surface of the work bench, and removed at pleasure. The average amateur, to my mind, wants to rip up timber with his circular saw quite as much, and even more so, than he requires to do a little cross cutting, tenoning, etc. At all events, the labour necessitated by the use of the rip saw is much greater than that of working the tenon saw. I trust that OLLA PODRIDA will remember that I have already mentioned this matter to him, and devise the machinery necessary to provide for the want that I have attempted to describe.—ED.]

Britannia Company's Combined Lathe and Fret Saw.

F. R. (*Croydon*).—I am advised by the Manager of the Britannia Company, *Colchester*, that the defect of which some have complained in the Company's "Combined Lathe and Fret-Saw" has been remedied in the machines that are now sent out to customers. A letter from you, or from any amateur who has experienced difficulty in working the machine, will receive the manager's best attention, and you will doubtless be put at once in the way of putting to rights the particular arrangement which does not give satisfaction at present. It is better to go to the fountain head at the outset in such cases as these. My experience is that manufacturers are always ready and willing to attend to those who wish to point out any defects in their specialities, whether real or fancied. It is only those who ask questions for the mere sake of questioning, and who propound their queries in such a way that there is no chance of replying to them in a satisfactory way, who get no answers to their letters; the recipients of the letters in question, seeing clearly that no advantage can possibly accrue either to the writers or to themselves, by entering into the correspondence that it is sought to pull on. In *bona fide* cases, such as yours, an answer to the point would be promptly given.

Working Models.

W. W. H.—If you mean "Working Models for Bazaars," if Mr. Donald Bede works out any thing novel in this direction he will in all probability describe it in the pages of this Magazine. Working models of other things will be described and illustrated in Vol. V., of which the first part will be Part 48, November, 1885.

Casting Foot from Nature.

B. R. (*Morecambe*).—A simple plan is to have a shallow box of sufficient length and width to receive the foot, and leave a couple of inches to spare all round. The person cast from has simply to be seated. Pour plaster into the bottom of the box, and put the foot in, taking care, of course, to keep it from touching the bottom by about half an inch. Then pour in more plaster, and so work it round the flesh that no air bubbles may be left, till you have moulded as much above the sole as will "leave" at once. The upper part of the foot can then be moulded in two pieces, with a joint running down at the ankle bones. It is better to have the box put together with screws, so that the wood may easily be removed to allow of breaking away the mould after the cast has been made.—M. M.

Cookery and Food Exhibition.

Messrs. BERTRAM and ROBERTS wish the readers of AMATEUR WORK to be informed that a great International Cookery and Food Exhibition will be held at the Royal Aquarium, Westminster, in December. The Exhibition will comprise some 150 Classes, and Gold, Silver, and Bronze Medals, together with valuable Money Prizes, will be offered in competition. Schedules, Prize Lists, and Entry Forms will shortly be issued, and the Exhibition promises to eclipse in magnitude, interest, and completeness, all affairs of a similar kind that have hitherto been held. For further information apply direct to Messrs. Bertram and Roberts, *Royal Aquarium, Westminster.*

Organ Building.

DULCET.—You will find a section of a metal pipe in the sketches accompanying the chapter on Tuning and Defects and their Remedies, in my "Organ Building for Amateurs," in AMATEUR WORK. Articles on Metal and Reed Pipe Making are in preparation.—M. W.

INFORMATION SUPPLIED.

Paint for Golf Balls.

E. S. D. writes in reply to H. M. D.:—"I have tried many different kinds of paint for golf balls. What I always use now is the paint sold in tins by all ironmongers. If H. M. D. prefers to mix the paint for himself, he should use more driers than for ordinary paint, and little or no turps, and mix the paint very thin with linseed oil. The best way of applying the paint is with a camel-hair brush, and the secret of getting a good glossy surface, and one that will last, is to apply four, or at the least, three coats of very thin paint. Of course, the old paint must be removed before applying the new. This is easily done by putting the balls into a strong solution of potash for an hour and a half. After taking them out, rub them with an old cloth, and wash well in water. When dry, they should be lightly sand-papered, and are then ready for painting. I find a useful contrivance for holding the balls whilst applying the paint is a stout needle fixed in a wooden handle. The needle is stuck a little way into the ball, and when a coat of paint has been applied, the wooden handle can be stuck into a hole in a block of wood, while the paint dries. I must add that each coat of paint should be quite dry before the next is applied. The balls are all the better if kept for a week or ten days before being used after repainting."

Mending Mackintosh.

BENJAMIN writes in reply to K. A. T. on the above subject:—"As those who have replied to your query do not give the process of making the solution, which is simple, cheap, and without risk, I beg to give the particulars, which are few, viz.: Procure, say ¼ lb. or ½ lb. of washed Para rubber, cut it up into small pieces and put in an air-tight tin, then add sufficient coal tar naphtha to cover; let it stand with lid on until dissolved, when it will be ready for use. If it should be too thick, add a little naphtha; if too thin, add a little more rubber."

Weight of Type.

T. W. H. (*Openshaw*).—The weight of a small fount of Long Primer type, to be of service, should be not less than 120 lbs. of Roman, and about 15 lbs. of italic.

Boiler for Small Engine.

A. F. S. (*Dresden*) writes to J. H. (*Whitchurch*):—"You must be more explicit in your query before you can expect an answer. Do you not know that engines of 2 inch, 3 inch, to 4 inch bore will give half-horse power, and yet each requires a different sized boiler. Until you give the diameter and stroke of cylinder, it is impossible to give an answer. This is what few people seem to understand."

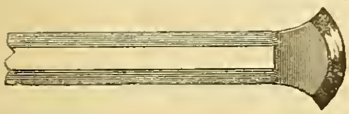
Waterproofing Cloth.

EDWARDUS writes in answer to D. D. (*Bala*):—"Dissolve $\frac{1}{4}$ lb. each of alum and sugar of lead in a pail full of soft water for three hours, and stir it occasionally. Then let it stand, and when clear, pour off without disturbing the sediment, and soak the cloth in the clear solution for twenty-four hours. Hang it up to drip dry. I have copied this from the 'Boy's Own Paper.'"

Drill for Stone.

A. F. S. (*Dresden*) writes to A. B. (*East Grinstead*):—"Why cannot you punch out the holes with hammer and chisel? No steel *drill* would keep an edge so as to cut. A diamond drill is the only one which will revolve without getting blunt and useless. Cost of these about £20."

TUBAL CAIN writes in answer to A. B. (*East Grinstead*):—"Stone, hard brick, and the like substances should not be drilled by



TOOL FOR DRILLING STONE.

rotatory motion of the tool in the common acceptation of the term, except in special cases, but by percussion, to which a rotatory or screw motion is given; the Ingersoll rock borer being a *practical* application of this theory. The *principle* is applied in hand operations in stone boring as follows: The tool, a bar of square or hexagonal cast steel, is flattened out and bevelled, as shown in sketch; this drill as it is turned is worked into the stone by sharp blows from a light hammer, proportionate to the size of the drill; after each blow the drill is lifted and slightly turned before the delivery of the next. In this way, holes not only deep, but very true, can be bored."

Stereotyping.

J. G. G. writes in reply to TWIST DRILL, page 456 of AMATEUR WORK:—"Take soft brown paper, two sheets, and damp evenly; paste first sheet with stereo compo (to be obtained from Harrild and Sons, Fleet Works, *London, E.C.*), lay on second sheet, and well rub down; paste again, and lay on a piece of tissue paper (dry), quickly lay on a piece of blotting paper, and well rub down, repeat until four tissues are on. Lightly dust last tissue with French chalk, and lay aside between two pieces of some non-absorbent material to mellow for two or three hours. Fasten the type by some means so as to present a true surface. Lay the above prepared paper on the type, tissue side down, and beat (gently at first) with a hard hair brush until the paper is driven into the recesses of the type. Leave under pressure until *quite dry*, then take off and well brush face with French chalk. Place in suitable iron mould, and pour in metal, leaving a good long head above the type.—Metal, 1 part tin, 1 antimony, 4 lead. Melt together, dip in a strip of cartridge paper; if it becomes straw-coloured in five seconds it is the right heat; if hotter than this, let it cool down to proper heat."

Clock Repairing, etc.

T. W. H. (*Openshaw*).—The promised papers on Clock Cleaning and Repairing, by OLLA PODRIDA, will appear in Vol. V. The name, or rather nom-de-plume, of this writer is a sufficient guarantee that the papers will be up to the mark, and carried out from commencement to finish, if no unforeseen and unexpected contingency bars the way.

Cement for Fixing Lamps.

T. W. H. (*Openshaw*) writes to J. B. C. (*Wootton-under-Edge*):—"If you want a cement for lamps, the following is how I fixed a paraffin lamp-burner. I first thoroughly cleaned the burner and body of lamp, and then got a lid of an old canister, and bent a spout in one side of it; then I got some alum and melted it over a clear fire, poured it in the socket of burner, and placed lamp in it and held it in place till cold, first warming the lamp and socket. It is like a piece of rock for firmness."

INFORMATION SOUGHT.

Steel Tube for Poppit Cylinder.

A. F. S. (*Dresden*) asks:—Where can I obtain steel tube $1\frac{7}{8}$ inch diameter outside, and $\frac{1}{4}$ inch bore. I want it for a poppit cylinder? If such cannot be bought, how could I bore it? Cylinder is about 14 inches long. I have no boring collar unfortunately.

Calico Painting.

PITMAN asks:—How is ox gall (in the solid form in pots) employed for preparing glazed calico for receiving colours?

Books on Coal Mining, etc.

PITMAN asks:—Can any reader recommend me a work on Laying Down Plans in Coal Mines? and also an elementary treatise on Stationary Steam Engines?

Water Wheel.

TRANSVAAL asks:—Will any reader inform me how to build a water wheel; overshot, breast, or undershot, either will do, to develop at most two-horse power. The water supply at command is as much as can run through a sluice 18 inches wide by 6 inches deep, with a fall of about 1 in 30. I should like to make the wheel of wood altogether if practicable. This correspondent hails from *Lydenburg, South African Republic*, and writes further:—

Dear Sir,—This is one of the many outlandish places that AMATEUR WORK has found its way to, and I cannot sufficiently praise it. Many a spare hour have I beguiled in reading and re-reading the different numbers, and working at such of the subjects therein treated as I can, for as you may suppose material of all kinds is very difficult to obtain. I have, however, succeeded in making much of the "Home-made Furniture," and am well satisfied with my efforts. I have just taken in hand the "Lawn Tennis Court Marker," which appeared in the last Number received (May). Will you kindly permit the enclosed query to appear in "Amateurs in Council," under the nom-de-plume of TRANSVAAL. I must mention that I have taken in AMATEUR WORK since the commencement through an agent in Cape Town. I cannot say too much in praise of it, and I hope all amateurs will derive as much instruction from it as I have.

Addresses of English Gauge Makers.

A. F. S. (*Dresden*) asks:—I should be much obliged if some reader could give me the address of a few English gauge makers.

Alteration of Fret Saw.

F. R. (*Croydon*) asks:—Will J. E. R., the writer of the paper, entitled, "An Amateur's Workshop and its Fittings," kindly inform me how he has altered his fret saw so as to work from underneath (Britannia Company's make), as I find mine of no use as it is now? By answering this he will greatly oblige a struggling amateur.

Composition for Transfer Patterns.

A. J. W. (*Ivybridge*) asks:—What is the composition made of that is used for drawing the patterns which ladies transfer to linen, velvet, etc., by ironing with a warm iron, for crewel work, lustroleum, etc.?

Atmospheric Motor.

F. R. G. (*Framlingham*) writes:—"In 'Cassell's' for March there is a description of an 'Atmospheric Motor' suitable for farm and household purposes. Can any of your readers state where they are made, and if they are a success?"

Check Till for Money.

W. C. F. (*Folkestone*) asks:—Is it possible for an amateur to make a check till for money? If so, how? Can electricity be used?

Repairing Desk.

PATTERN MAKER writes:—"I have a desk bound with brass bands, one of which has become loose. I should be glad if any one could tell me how to repair it; also, how to fasten the brass on squares, and to true them up."

Harmonium Building.

BENJAMIN writes:—"I am desirous of building a harmonium with five rows of reeds, *i.e.*, six half rows in treble, and four half rows in bass. Will any of our musical contributors please say if it is possible to place the whole of the reeds in a horizontal reed box, and, if so, please give dimensions how the said reed box should be divided; also, please give suitable dimensions for feeder bellows, reservoir, wind-chest, with length, breadth, and depth of channels that would be required to be cut in channel board, with any other hints as would be of value to produce a good effect in such an instrument? It would also be a boon to give dimensions for frame to carry the above, with sketch. I have a good idea how to manage the remainder, as I would buy reeds etc., ready voiced and made."

Foot Plates for Models.

A. F. S. (*Dresden*) asks:—How are the diamonds cut on these small foot plates, especially when the plates are convex? Flat plates I cut on a planer, but the result is not altogether as satisfactory as might be.

Division Plate.

A. F. S. (*Dresden*) writes:—"How can I put a division plate on a back-geared lathe? I want something that will not be difficult to make. I don't want to go to any expense, as I have designed an improved headstock which has the division plate on the pulley, but it will take some time to make."

Planing Machine.

A. F. S. (*Dresden*) writes:—"On my planing machine I find great difficulty in holding work. It is always slipping away. I use angle plates, but find they tilt up when the screws are in the top holes. The plates are only 3 inches high; I have also some small clamp blocks, 1½ in. high, these don't tilt, but slip away. The machine is designed to plane 8 inches high, but I can't hold anything on. What is the cause and the remedy? Further, I should like to know what clamps are used to hold work 7 inches high? I am making a vice, but this will only hold small articles."

SALE, PURCHASE, OR EXCHANGE.

Persons availing themselves of this Department of AMATEUR WORK *are requested to note that—*

(1) *No Trade Advertisements can be inserted in this Department, which is open to bonâ fide Amateurs only. The Editor reserves the right of refusing to insert any notice.*

(2) *No charge will be made for the insertion of notices until their number be such as to render it absolutely necessary to do so.*

(3) *Persons writing in reply must forward application under cover to the Editor, in an envelope sealed down, with a Penny Stamp attached in the upper right hand corner, and the* NUMBER *of the notice in the lower left hand corner thus:—*

	STAMP here.
NO. OF NOTICE here.	

(4) *Letters thus marked and enclosed under cover to the Editor will be forwarded immediately to owners of articles for Sale or Exchange, or persons wishing to purchase. No attention will be paid to any communications in which these Rules are not strictly observed.*

(5) *It is desirable that those who reply to notices in this Department should enclose to the advertiser, with their application, a stamped and directed envelope, in order to ensure a reply. When this precaution is not taken, the non-receipt of a reply within reasonable time can only intimate that the article in question is disposed of, or that the proposal made is declined.*

---

657. Black Mackintosh Driving Apron, lined with blue cloth, equal to new, never been used. Cost £1, will sell for 15s., or exchange for gentleman's fashionable coat, or jacket, in decent order, waist about 33 inches, or offers. (*Bury.*)

658. Flowers and Fruit Trees. — (1) Healthy cuttings of Show and Fancy Pansies, all the best in cultivation, correctly named, 1s. 6d. per doz., 5s. for 50, 9s. per 100, post free. (2) Seedling Pansies from Prize Flowers, a perfect mass of flower, making a grand show, will bloom throughout the winter, more or less, 1s. 3d. per doz., free. (3) Young Show Gooseberry Trees, 2 and 3 years old, all the leading kinds, ready in November. (4) Roses, budded on Standard Brier, 10s. and 12s. per doz. (*Bury.*)

659. Books, Various. — (1) Transparent Painting on Glass; (2) Magic Lantern; (3) The Model Steam Engine. All in good condition. Will exchange for Parts 1 to 6, AMATEUR WORK. (*Leeds.*)

660. Fret Saws and Mitre Cutter.—(1) Shamrock Fret-saw for fitting to a sewing machine stand, truly vertical stroke, quite new; (2) Rogers' Fret-saw, in good condition; (3) Griffin's Patent Mitre Cutter for Picture Frames. What offers? (*Exeter.*)

661. Amateur Work.—Vols. I., II., III., clean, unbound, in good condition, will exchange for Microscope. (*Alderley Edge.*)

662. Amateur Work. — Three volumes complete, two bound, one unbound, clean and perfect. Price 12s. the lot. (*Holloway, N.*)

663. Quarter-Plate Camera and Lens, background landscape, iron head-rest. Exchange for useful articles or books. (*Westerham.*)

664. English Mechanic, 12 vols., unbound, in fair condition (three numbers missing), with indexes. Will take a little over waste paper price, purchaser to pay carriage. (*Shrewsbury.*)

665. Books on Photography.—Wanted, all or any of the following: A B C of Photography; Principles and Practice, J. Werge; Amateur's First Handbook, J. W. T. Ellerbeck; Instructions in Photography, Abney; Emulsion Processes, Abney; Practical Working Gelatine Emulsion, Abney; Pictorial Effect, Robinson; Art and Practice Silver Printing, Robinson; The Studio, Robinson; Modern Dry Plates, Elders; Æsthetics of Photography, Heighway; Practical Portrait Photography, Heighway; Enamelling and Re-touching, P. Piquepe; Photography for Amateurs, Hepworth; Amateur Photographer, E. Wallace, M.D.; Amateur Photography, D. J. Tapley; Autotype Process, J. R. Sawyer; Practical Guide to Photography, Marion and Co.; How to become a Successful Amateur Photographer, Lancaster; Burton's Modern Photography; Dallmeyer on Lenses; Photographer's Guide; and any other books on the art. Good exchange given. (*Horsforth.*)

666. Illustrated Carpenter and Builder. —Six volumes bound in cloth, 10s. the lot, carriage free. (*Belfast.*)

667. Amateur Work.—Parts 1 to 46, inclusive, clean and perfect. Will take 15s., purchasers to pay carriage. (*Finsbury Park, N.*)

668. Hand Drill for Fretwork.—Miller's Falls, No. 4, all iron, with Archimedean Chuck, 2s. 6d., or offers. (*Dursley.*)

669. Collar Stud, and three for fronts. Gold fronts, new, cost 7s. 6d. What offers? (*Dursley.*)

670. Griffin Mitre Cutter, with screw for holding moulding when nailing. What offers? (*Dursley.*)

671. Small Table in Pearwood (Fretwork), size 4½ in. by 4¾ in. What offers? (*Dursley.*)

672. Organ Pipes, etc.—Wanted, Organ Pipes and other requisites for Organ Building. (*Derby.*)

673. Amateur Work.—Wanted, two or three volumes, cheap. (*Derby.*)

674. Leclanche Cell for Electric Bells, etc. (agglomerate form), outer cell, and Sal Ammoniac. Complete for 2s. (*Manchester.*)

675. Gramme Ring, neatly wound, 3½ diameter, 1¼ wide; would make dynamo that would light two 10-candle lamps. Price 5s. 6d. (*Manchester.*)

676. Science for All.—Seventeen Parts (cost 7d. each) in first-class condition, 5s. Cash purchaser to pay carriage, or exchange for a Lancaster ¼-plate Camera Lens. (*Dublin.*)

677. English Concertina (48 keys) for sale, in mahogany lock-up case. Wanted, Organ Materials. (*Derby.*)

678. Flywheel and Double Crankshaft, also two American pulleys, 10s. the lot; about 1 cwt. (*Crewe.*)

679. Marionnette Proscenium, or would suit children's plays, opening 7 ft. by 5 ft.; not been used, price 15s. (*Crewe.*)

680. Fancy Woods.—Small blocks of about 3 inches square, of many varieties, from abroad (about 40). What offers or exchange? (*London, S.E.*)

681. Every Man His Own Mechanic.— Wanted, the complete work, in good condition, clean, in exchange for Booth's best Walnut Wood Hand Fret-saw Frame, 15 inches span, in capital order, cost 15s. (*Hull.*)

682. Banjo.—A first-class Seven-stringed Banjo, Hobson's patent, brass frets, inlaid on ebony staff, quite new, cost £2, will sell for £1, or offers. (*Birkenhead.*)

683. Lathe Bed.—Wanted, a Straight Lathe Bed, about 3 ft. 6 in long, 6½ or 7 in. face. Must be in good condition. (*Bilston, Staff.*)

684. Telegraphic Apparatus. — Two Single Needle, one with Bell, cost £3 3s., quite new. What offers in cash or exchange? (*Clapham.*)

685. Oxy-hydrogen Jet, in perfect order, useful. Exchange or cash offers. (*Clapham.*)

686. Compound Slide-Rest for a 5-inch lathe, and fret arm which will suit any lathe. Will sell for 22s., or exchange for tools. (*Kelvedon.*)

687. Dynamo.—All finished, except wiring. A bargain to anyone wishing to make one, as the metal work is finished. Price 30s. (*Keighley.*)

688. Pair of Acme Skates and Wooden Telescope Stand for sale, or will exchange for Vols. I. and II. of AMATEUR WORK. (*Keighley.*)

689. Organ Pipes.—Set of Open Diapason, 44 pipes, Tenor C to G, made of paper, according to Mr. Wicks' instruction. Tuned and finished complete. First offer over 10s. taken. Can be heard on the organ before purchase. (*Stratford, E.*)

690. Books, Various. — Cassell's European Butterflies and Moths, first 15 parts, post free, 4s. 6d.; also, English Mechanic, numbers 928 to 937, and first 4 parts of Science for All. Free for 7s 6d. the lot, or separately as above. All perfectly clean and new. (*Oxford.*)

691. Printing Press.—Wanted, Amateur Press, self-inking or hand. State price and maker. To print not less than 9 in. by 7 in. (*Glasgow.*)

692. Amateur Work.—Parts 13, and 40 to 47, nine parts in all, in good condition. What offers in exchange? (*Wisbech.*)

693. Five-and-a-half-inch Lathe, back-geared, with wooden bed, 5 ft. by 6 in. by 2 in., iron plated (filed true) flywheel, about ¾ cwt., long shaft, 1¾ in. turned, brass bearings, treadle, all iron, working in iron bearings, pitch pine foot-board, 9 inch face plate, four chucks. All perfectly new, beautifully finished, and would suit some one commencing the trade, being so substantial in make. Will exchange for 3½ in. or 4 in. (latter preferred) secondhand screw-cutting lathe, complete. (*Waterford.*)

694. Electrical or Shocking Coil, with Double Carbon Bichromate Battery, regulator, lifting arrangement for zinc, handles, cords, etc. Very powerful. Price 18s. 6d. (*Eastbourne.*)

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